



## **INTRODUCTION JEEP AW-4**

The AW-4 is a four speed, electronically controlled automatic transmission. Running gear consists of a lock-up converter:oil pump:three planetary gear sets:clutch and brake units:hydraulic accumulators:a valve body with electric solenoids and a transmission computer unit (TCU). Cables are used for shifting and throttle pressure control. A neutral safety switch permits engine starting in Park and Neutral range only. The valve body solenoids are controlled by signals from the TCU. Signal sequence is determined by vehicle speed and throttle position. Fourth gear is an .70:1 ratio overdrive range. First second,third and reverse gear are conventional ranges. Third gear ratio is 1:1. A separate planetary gear set provides overdrive operation in fourth gear.

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## JEEP AW-4

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## JEEP AW-4

### GEAR SHIFT POSITIONS

The AW-4 transmission has six gear shift lever positions. Park, Reverse and Neutral positions are conventional and mechanically operated. The 1-2, 3 and D ranges provide electronically controlled shifting.

The 1-2 position provides first and second gear only. The 3 position provides first, second and third gear. The D range provides first through fourth gear. Overdrive fourth gear range is available only when the shift lever is in D position (Fig. 2).

### TRANSMISSION IDENTIFICATION

The transmission I.D. plate is attached to the case (Fig. 3). The plate contains the transmission serial and model numbers. Refer to the information on this plate when ordering service parts.

### COMPONENTS AND OPERATION

#### Electronic Controls

The AW-4 is electronically controlled in the forward gear ranges. The controls consist of the TCU, valve body solenoids and sensors that monitor vehicle speed, throttle opening, shift lever position and brake pedal application.

#### TCU

The TCU determines shift and converter lockup timing based on signals from the sensors. The valve body solenoids are activated/deactivated accordingly.

The TCU has a self diagnostic program. Component and circuitry malfunctions can be diagnosed with the

DRE II tester. Once a malfunction is noted and stored in TCU memory, it is retained even after the problem has been corrected. To cancel a stored malfunction, simply disconnect and reconnect the "Trans." fuse in the TCU harness.

#### Shift Modes

Two separate shift modes are programmed into the TCU. The Comfort mode provides normal shift speeds and points. The Power mode provides higher engine speeds and shift points when extra acceleration and torque are needed. The shift modes are activated by a switch in the instrument panel.

#### Valve Body Solenoids

The solenoids are mounted on the valve body and operated by the TCU. The solenoids control operation of the converter lockup and shift valves in response to input signals from the TCU.

#### Sensors

The sensors include the throttle position sensor (TPS), the speed sensor, the neutral safety switch and the brake pedal application switch.

The throttle position sensor is mounted on the throttle body. It electronically determines throttle position and relays this information to the TCU to control shift points and converter lockup.

The speed sensor consists of a rotor and magnet on the transmission output shaft and a switch in the extension housing or adapter. The sensor switch is activated each time the rotor and magnet complete one revolution. Sensor signals are transmitted to the TCU.

The neutral safety switch is mounted on the valve body manual shaft. The switch signals shift linkage and manual valve position to the TCU through an interconnecting harness. The switch prevents engine starting in all gears other than Park or Neutral.

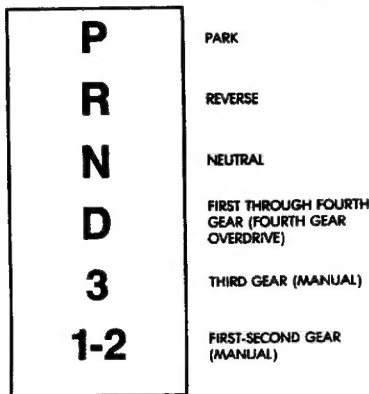


Fig. 2 Gear Shift Positions

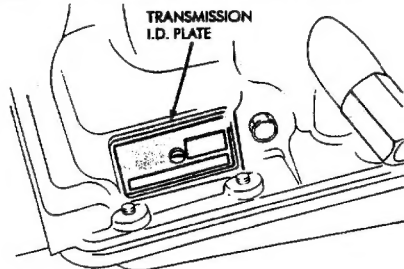


Fig. 3 Transmission Identification

The brake application switch releases the lock-up clutch in the torque converter whenever the brakes are applied. The switch is mounted on the brake pedal bracket and signals the TCU when the pedal is pressed or released.

## TORQUE CONVERTER

A lockup torque converter is used for all applications. The lockup mechanism consists of a sliding clutch piston, clutch springs and the clutch disc (Fig. 4).

The disc is attached to the converter front cover. The clutch piston and clutch springs are attached to the

turbine hub. The springs dampen engine firing impulses and loads during the initial phase of converter lockup.

Lockup is controlled by valve body solenoid number three and by the lockup relay valve. At lockup speed, the solenoid channels line pressure to the lockup clutch through the relay valve.

Torque converter lockup occurs in second gear in 1-2 position; third gear in 3 position and third and fourth gear in D position.

## FOURTH GEAR OVERDRIVE COMPONENTS

The overdrive system consists of the input shaft, one-way clutch, planetary sun gear, ring gear, planetary carrier, direct clutch and overdrive brake (Fig. 5). The overdrive elements are controlled and applied through valve body solenoid number two.

In overdrive fourth gear, the brake prevents the overdrive sun gear from turning. During operation, the overdrive elements operate as follows:

The overdrive input shaft and planetary carrier rotate as a unit. The sun gear and overdrive direct clutch drum are in mesh and operate as a single unit. The direct clutch splines function as the hub for the overdrive brake. The one-way clutch outer race is in mesh with the planetary carrier. The inner race is fixed to the sun gear shaft.

## FIRST-THIRD-REVERSE GEAR COMPONENTS

First-third and reverse gear components are outlined in Figure 6.

The input shaft is meshed with the direct clutch hub and the forward clutch drum. These elements rotate as a unit. The forward clutch hub rotates as a unit with the front planetary ring gear. The direct clutch drum is meshed with the forward end of the planetary sun gear.

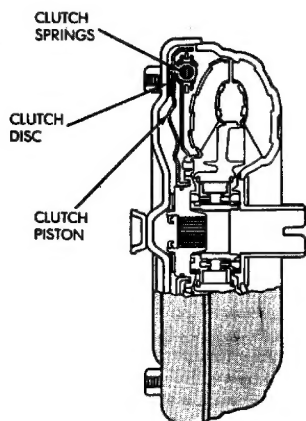


Fig. 4 Lockup Torque Converter

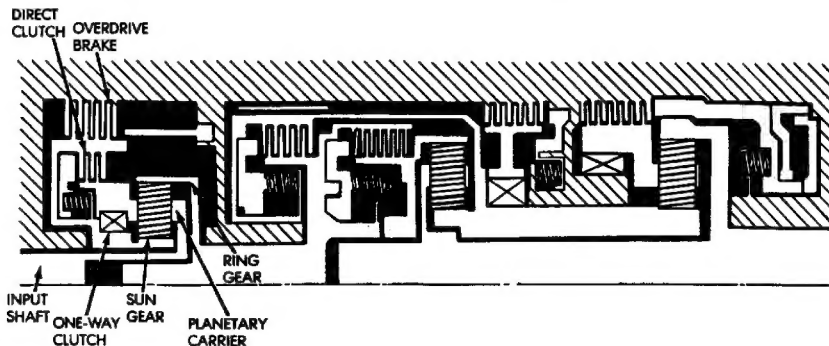


Fig. 5 Fourth Gear Overdrive Components

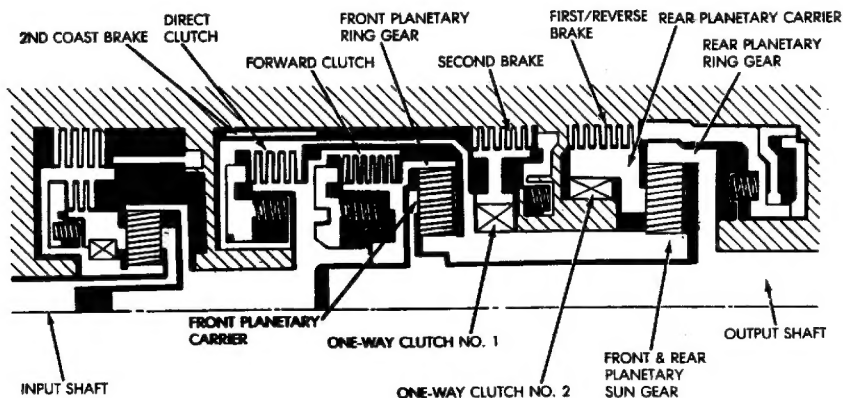
The second brake hub serves as the outer race of one-way clutch No. 1. The clutch inner race is locked with the front/rear sun gear. The inner race of one-way clutch No. 2 is splined to the transmission case and is locked. The outer race rotates as a unit with the rear planetary carrier.

The rear planetary ring gear is splined to the output shaft. The front planetary carrier and rear carrier ring gear are meshed and rotate as a unit with the output shaft.

## GEARTRAIN OPERATION AND APPLICATION CHARTS

Operation and application of the first through fourth and reverse gear elements are outlined in the function and application charts.

The Component Function Chart (Fig. 7) describes basic function of various geartrain elements. The Component Application Chart (Fig. 8) indicates which elements (including valve body solenoids), are applied in the various gear ranges.



**Fig. 6 First-Third And Reverse Gear Components**

NOMENCLATURE	FUNCTION
Overdrive Direct Clutch	Connects overdrive sun gear and overdrive carrier
Overdrive Brake	Prevents overdrive sun gear from turning either clockwise or counterclockwise
Overdrive One-Way Clutch	When transmission is driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch	Connects input shaft and front ring gear
Direct Clutch	Connects input shaft and front and rear sun gear
Second Coast Brake	Prevents front and rear sun gear from turning either clockwise or counterclockwise
Second Brake	Prevents outer race of No. 1 one-way clutch from turning either clockwise or counterclockwise, thus preventing front and rear sun gear from turning counterclockwise
First/Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclockwise
One-Way Clutch No. 1	When second brake is operating, prevents front and rear sun gear from turning counterclockwise
One-Way Clutch No. 2	Prevents rear planetary carrier from turning counterclockwise

**Fig. 7 Component Function Chart**

Shift Lever Position	Gear	Valve Body Solenoid No. 1	Valve Body Solenoid No. 2	OVERDRIVE CLUTCH	FORWARD CLUTCH	DIRECT CLUTCH	OVERDRIVE BRAKE	SECOND COAST BRAKE	SECOND BRAKE	FIRST/REVERSE BRAKE	OVERDRIVE ONE-WAY CLUTCH	NO. 1 ONE-WAY CLUTCH	NO. 2 ONE-WAY CLUTCH
P	Park	ON	OFF	•									
R	Reverse	ON	OFF			•				•	•		
N	Neutral	ON	OFF	•									
D	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•				•			•	
	Third	OFF	ON	•	•	•				•	•		
	OD	OFF	OFF		•	•	•		•				
3	First	ON	OFF	•	•						•		•
	Second	ON	ON	•	•			•	•		•	•	
	Third	OFF	ON	•	•	•			•				
1-2	First	ON	OFF	•	•					•	•		•
	Second	ON	ON	•	•			•	•		•	•	

• = Applied

Fig. 8 Component Application Chart

## HYDRAULIC SYSTEM

The basic hydraulic system consists of the oil pump, valve body and solenoids and four hydraulic accumulators. The oil pump provides the necessary system lubrication and operating pressure.

The valve body controls application of the clutches, brakes, second coast band and the torque converter lockup clutch. The valve body solenoids control sequencing of the 1-2, 2-3 and 3-4 shift valves within the valve body. The solenoids are activated by signals from the TCU.

The accumulators are used in the clutch and brake feed circuits to control initial apply pressure. Spring loaded accumulator pistons modulate the initial surge of apply pressure for smooth engagement.

## Oil Pump

A gear-type oil pump is used in all AW-4 transmissions. The pump gears are mounted in the oil pump body. The drive gear is operated by the torque converter hub. Drive tangs on the hub engage in drive slots in the drive gear.

## Valve Body Components

Transmission operating pressure is supplied to the clutch and brake apply circuits through the valve body. The valve body consists of an upper body, lower body, separator plate and upper and lower gaskets (Fig. 9). The various spool valves, sleeves, plugs and springs are located within the two body sections.

The manual valve, 1-2 shift valve, primary regulator valve, accumulator control valve, check balls, solenoids and oil strainers are located in the lower body section (Fig. 10). The remaining control and shift valves plus

check balls and one additional oil strainer are located in the upper body section (Fig. 11).

## Manual Valve

The manual valve is operated by the gearshift linkage. The valve diverts fluid to the apply circuits according to shift lever position.

## Primary Regulator Valve

The primary regulator valve (Fig. 13) modulates line pressure to the clutches and brakes according to engine load. The valve is actuated by throttle valve pressure.

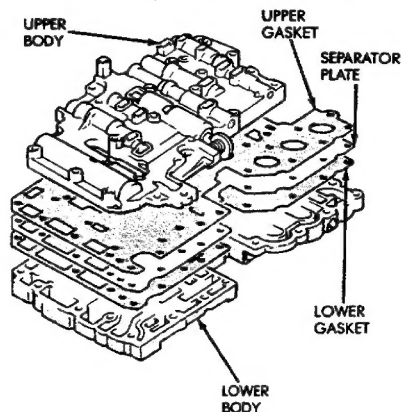


Fig. 9 Two-Section Valve Body

# DIAGNOSIS INFORMATION

## GENERAL DIAGNOSIS INFORMATION

The TCU used with the AW-4 transmission has a self-diagnostic program. The program is compatible with the DRB II tester.

The AW-4 is an electronically controlled transmission. Shift points and sequence in the forward gear ranges are controlled by the TCU. Before attempting repair, it will be necessary to determine if a malfunction is electrical or mechanical.

The DRB II tester will identify faults in the electrical control system. The road test, pressure test, stall test and time lag test plus the general diagnosis charts will help locate faults in the mechanical running gear.

All AW-4 diagnosis should begin with the Preliminary Check Procedure. The procedure is designed to help identify the type of problem (mechanical/electrical) that has occurred. The first step of the procedure is Initial Inspection and Adjustment which is detailed in this section.

## INITIAL INSPECTION AND ADJUSTMENT

- (1) Check and adjust shift linkage.
- (2) Verify line pressure cable operation. Repair or replace cable if it binds or is damaged.
- (3) Check engine throttle operation. Have helper press accelerator to floor and observe injector throttle plate movement. Adjust linkage if throttle plate does not reach wide open position.
- (4) Check and adjust line pressure cable if necessary.
- (5) Check transmission fluid level when fluid is at normal operating temperature. Start engine. Shift transmission through all gear ranges then back to Neutral. Correct level is to Full or Add mark on dipstick with engine at curb idle speed.
- (6) Check and adjust neutral switch if necessary.
- (7) Check TPS adjustment and operation. Adjust the sensor if necessary.

## MANUAL SHIFTING TEST

- (1) This test determines if the problem is related to a mechanical or electrical component.
- (2) Stop engine and disconnect TCU or TCU fuse.
- (3) Road test vehicle. Shift transmission into each gear range. Transmission should operate as follows:
  - lock in Park
  - back up in Reverse

- not move in Neutral
- provide first gear only with shift lever in 1-2 position
- operate in third gear only with shift lever in 3 position
- operate in overdrive fourth gear in D position

(4) If transmission operates as described, proceed to next step. However, if forward gear ranges were difficult to distinguish (all feel the same), or vehicle would not back up, refer to diagnosis charts. Do not perform stall or time lag tests.

**CAUTION: Do not overspeed the engine during the next test step. Ease off the throttle and allow the vehicle to slow before downshifting.**

(5) Continue road test. Manually downshift transmission from D to 3, and from 3 to 1-2 position. Then manually upshift transmission through forward ranges again.

(6) If transmission operation is OK, perform stall, time lag and pressure tests. If transmission shifting problem is encountered, refer to diagnosis charts.

(7) If a problem still exists, continue testing with DRB II tester.

## HYDRAULIC PRESSURE TEST

### Pressure Test Procedure

(1) Connect pressure test gauge to test port on passenger side of transmission. Use adapter 7554 to connect gauge. Be sure test gauge capacity is a minimum of 300 psi (2100 kPa).

(2) Bring transmission fluid to normal operating temperature.

(3) Apply parking brakes and block wheels.

**WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE WHILE PERFORMING THE FOLLOWING STEPS IN THE PRESSURE TEST.**

(4) Check and adjust engine curb idle speed.

(5) Apply service brakes.

(6) Shift transmission into D range and note line pressure with engine at curb idle speed. Pressure should be 53-to-61 psi (363-to-422 kPa).

(7) Press accelerator to wide open throttle position and note line pressure. Pressure should be 161-to-196 psi (1108-to-1353 kPa).

**CAUTION: Do not maintain wide open throttle for more than three or four seconds at a time.**

(8) Shift transmission into Reverse and note line pressure with engine at curb idle speed. Pressure should be 73-to-87 psi (500-to-598 kPa).

(9) Press accelerator to wide open throttle position and note line pressure in Reverse. Pressure should be 223-to-273 psi (1540-to-1883 kPa).

**CAUTION: Do not maintain wide open throttle for more than three or four seconds at a time.**

(10) If line pressure is not within specifications, adjust line pressure cable and repeat pressure test.

## Pressure Test Analysis

If pressures in D and Reverse are higher than specified, check for the following:

- line pressure cable loose, worn, binding or out of adjustment

- throttle valve, downshift plug, throttle cam sticking, worn or damaged

- primary regulator valve sticking, worn, or damaged
- If pressures in D and Reverse are lower than specified, check for the following:

- line pressure cable loose, worn, binding or out of adjustment
- throttle valve, downshift plug, throttle cam sticking, worn or damaged
- primary regulator valve sticking, worn, or damaged
- oil pump gears or housing worn or damaged
- overdrive clutch worn or damaged

If pressures are low in D range only, check for the following:

- forward clutch worn or damaged
- fluid leakage in D range circuit (component seal and O-rings)

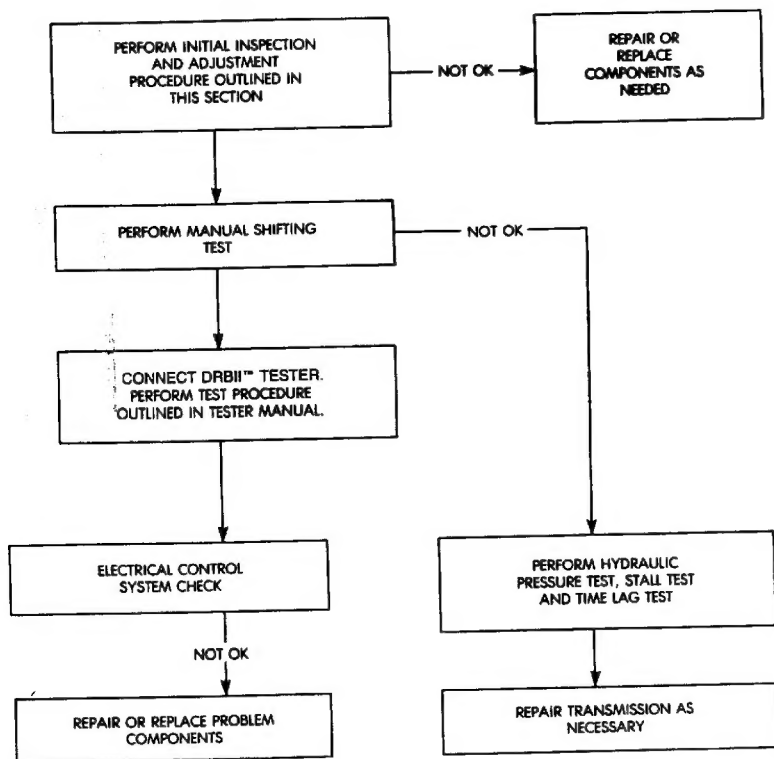


Fig. 26 Preliminary Check Procedure



If pressures are low in Reverse only, check for the following:

- shift linkage (and manual valve) out of adjustment
- fluid leakage in Reverse circuit (component seal and O-rings)
- direct clutch worn or damaged
- first/reverse brake worn or damaged

## STALL TEST

(1) The stall test checks holding ability of the transmission clutches and brakes and the torque converter stator clutch.

(2) Bring transmission fluid to normal (hot) operating temperature.

(3) Connect tachometer to engine. Position tachometer so it can be viewed from drivers seat.

(4) Apply parking brakes and block wheels.

(5) Apply and hold service brakes.

(6) On 4WD models, shift transfer case into two-wheel high position.

(7) Start engine.

**WARNING: DO NOT ALLOW ANYONE TO STAND AT THE FRONT OR REAR OF THE VEHICLE DURING THE TEST.**

(8) Shift transmission into D range.

(9) Press accelerator to wide open throttle position and note maximum engine rpm. Stall speed should be 2100-to-2400 rpm in D range.

**CAUTION: Do not maintain wide open throttle for more than four or five seconds at a time.**

(10) Release throttle and shift transmission into Neutral. Allow transmission fluid to cool for 15-20 seconds.

(11) Shift transmission into Reverse.

(12) Press accelerator down to wide open throttle position and note maximum engine rpm. Stall speed

should be 2100-to-2400 rpm in Reverse.

## Stall Speed Test Analysis

If engine rpm is lower than specified in D and Reverse, check for the following:

- engine output/performance insufficient
- stator clutch in torque converter not holding if engine speed was 1500 rpm or less.

If stall speed in D range is higher than specified, check for the following:

- line pressure low
- forward clutch slipping
- No. 2 one-way clutch not holding
- overdrive one-way clutch not holding

If stall speed in Reverse was higher than specified, check for the following:

- line pressure low
- direct clutch slipping
- first/ reverse brake slipping
- overdrive one-way clutch not holding

If stall speeds were higher than specified in both D and Reverse, check for the following:

- low fluid level
- line pressure low
- overdrive one-way clutch not holding

## TIME LAG TEST

This test checks general condition of the overdrive clutch, forward clutch, rear clutch and first/reverse brake. Condition is indicated by the amount of time required for clutch/brake engagement with the engine at curb idle speed. Engagement time is measured for D and Reverse positions. A stop watch is recommended for test accuracy.

## Test Procedure

(1) Check and adjust transmission fluid level if necessary.

(2) Bring transmission to normal (hot) operating temperature.

(3) Apply parking brakes.

(4) Turn off air conditioning unit.

(5) On 4WD models, shift transfer case into two-wheel high.

(6) Start engine and check curb idle speed. Adjust speed if necessary. Curb idle must be correct to ensure accurate test results.

(7) Shift transmission into Neutral and set stop watch.

(8) During following test steps, start stop watch as soon as shift lever reaches D and Reverse detents.

(9) Shift transmission into D range and record time it takes for engagement. Repeat test two more times.

(10) Reset stop watch and shift transmission back to Neutral.

(11) Shift transmission into Reverse and record time it takes for engagement. Repeat test two more times.

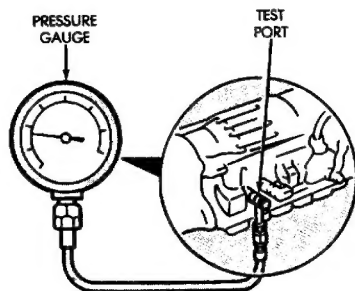


Fig. 27 Pressure Test Gauge Hookup

(12) Engagement time in D range should be a maximum of 1.2 seconds. Engagement time for Reverse should be a maximum of 1.5 seconds.

## Time Lag Test Analysis

If engagement time is longer than specified for D range, check for the following:

- shift linkage misadjusted
- line pressure low

- forward clutch worn
  - overdrive clutch worn or damaged
- If engagement time is longer than specified for Reverse, check for the following:
- shift linkage misadjusted
  - line pressure low
  - direct clutch worn
  - first/reverse brake worn
  - overdrive clutch worn or damaged

CONDITION	POSSIBLE CAUSE	CORRECTION
FLUID DISCOLORED OR SMELLS BURNT	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and repair transmission
VEHICLE DOES NOT MOVE IN ANY FORWARD RANGE OR REVERSE	Shift linkage out of adjustment Valve body or primary regulator faulty Park lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect/repair valve body Repair park pawl Replace torque converter Replace drive plate Clean screen Disassemble and repair transmission
SHIFT LEVER POSITION INCORRECT	Shift linkage out of adjustment Manual valve and lever faulty	Adjust linkage Repair valve body
HARSH ENGAGEMENT (ALL RANGES)	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Repair valve body Repair pistons Disassemble and repair transmission
DELAYED 1-2, 2-3 OR 3-OD UP-SHIFT, OR DOWN-SHIFTS FROM 4-3 OR 3-2 AND SHIFTS BACK TO 4 OR 3	Electronic control problem Valve body faulty Solenoid faulty	Find faulty part with DRBII™ Tester * Repair valve body Repair solenoid
SLIPS ON 1-2, 2-3 OR 3-OD UP-SHIFT, OR SLIPS OR SHUDDERS ON TAKE-OFF	Shift linkage out of adjustment LP cable out of adjustment Valve body faulty Solenoid faulty Transmission faulty	Adjust linkage Adjust cable Repair valve body Replace solenoid Disassemble and repair transmission
DRAG OR BIND ON 1-2, 2-3 OR 3-OD UP-SHIFT	Shift linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Repair valve body Disassemble and repair transmission
NO LOCK-UP IN 2ND, 3RD OR OD	Electronic control problem Valve body faulty Solenoid faulty Transmission faulty	Repair with DRBII™ Tester * Repair valve body Replace solenoid Disassemble and repair transmission

\* or Snap-On Scanner, OTC Scanner



## SERVICE DIAGNOSIS (CONT.)

CONDITION	POSSIBLE CAUSE	CORRECTION
HARSH DOWN-SHIFT	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust cable Replace cable and cam Repair pistons Repair valve body Disassemble and repair transmission
NO DOWN-SHIFT WHEN COASTING	Valve body faulty Solenoid faulty Electronic control problem	Repair valve body Replace solenoid Locate problem with DRBII™ Tester *
DOWN-SHIFT LATE OR EARLY DURING COAST	Throttle cable faulty Valve body faulty Transmission faulty Solenoid faulty Electronic control problem	Replace cable Repair valve body Disassemble and repair transmission Replace solenoid Locate problem with DRBII™ Tester *
NO OD-3, 3-2 OR 2-1 KICKDOWN	Solenoid faulty Electronic control problem Valve body faulty	Replace solenoid Locate problem with DRBII™ Tester* Repair valve body
NO ENGINE BRAKING IN 1-2 POSITION	Solenoid faulty Electronic control problem Valve body faulty Transmission faulty	Replace solenoid Locate problem with DRBII™ Tester * Repair valve body Disassemble and repair transmission
VEHICLE DOES NOT HOLD IN PARK	Shift linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Replace cam and spring

\* or Snap-On Scanner, OTC Scanner



# SERVICE INFORMATION

## JEEP AW-4

### CHECKING TRANSMISSION FLUID LEVEL AND CONDITION

#### Recommended Fluid

Recommended fluid for AW 4 transmissions is Jeep or Mopar Mercon™ automatic transmission fluid. Mopar Dexron II™ may also be used if Mercon fluid is not available.

#### Checking Fluid Level

(1) Be sure transmission fluid is at normal operating temperature. Normal operating temperature is reached after approximately 15 miles (25 km) of operation.

(2) Position the vehicle on a level surface. This is important for an accurate fluid level check.

(3) Shift the transmission through all gear ranges and back to Neutral.

(4) Apply the parking brakes.

(5) Verify that the transmission is in Neutral.

(6) Wipe off the dipstick handle to prevent dirt from entering the fill tube. Then remove the dipstick and check fluid level and condition.

(7) Correct fluid level is to the **FULL** mark on the dipstick when the fluid is at normal operating temperature (Fig. 1).

(8) If fluid level is low, top off the level with Jeep Mercon™, transmission fluid. Mopar Dexron II™ may also be used if Mercon is not available. Do not overfill the transmission. Add only enough fluid to bring the level to the **FULL** mark.

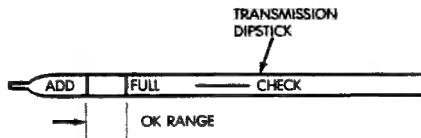


Fig. 1 Transmission Fluid Level

#### Checking Fluid Condition

Inspect the appearance of the fluid during the fluid level check. The fluid should be clear and free of foreign material or particles. If the fluid is dark brown or black in color and smells burnt, the fluid has been overheated and should be replaced.

Transmission operation should also be checked if the fluid is severely discolored and contains quantities of foreign material, metal particles, or clutch disc friction material.

**A small quantity of friction material or metal particles in the oil pan is normal. The particles are usually generated during the break-in period and indicate normal seating of the various transmission components.**

### TCU SERVICE

Use the DRB II tester to diagnose TCU function whenever a fault is suspected. Replace the TCU only when the tester indicates a TCU fault.

#### TCU Replacement

The TCU is located under the instrument panel on the passenger side of the vehicle (Fig. 2). Turn the ignition off. Remove the TCU by unsnapping the wire harness connector and removing the TCU from under the instrument panel. To install the replacement part, snap the wire harness connector into the new TCU and position it under the panel.

### NEUTRAL SWITCH

#### Switch Testing

Test switch continuity with an ohmmeter. Disconnect the switch and check continuity at the connector terminal positions and in the gear ranges indicated in Figure 3. Switch continuity should be as follows:

- Continuity should exist between terminals B and C with the transmission in Park and Neutral only (Fig. 3).
- Continuity should exist between terminals A and E with the transmission in Reverse (Fig. 3).

- Continuity should exist between terminals A and G with the the transmission in third gear (Fig. 3).
- Continuity should exist between terminals A and H with the transmission in first and/or second gear (Fig. 3).
- Continuity should **not** exist in D position.

## Neutral Switch Removal

- (1) Raise vehicle.
- (2) Disconnect switch wire harness connector.
- (3) Pry washer lock tabs upward and remove switch attaching nut and tabbed washer (Fig. 4).
- (4) Remove switch adjusting bolt (Fig. 4).

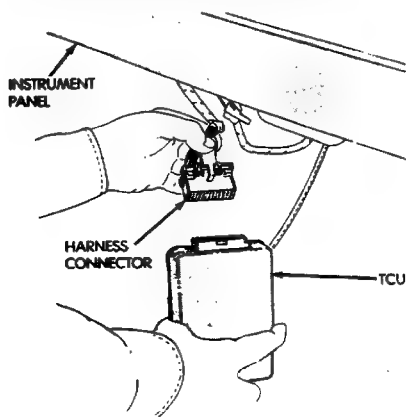
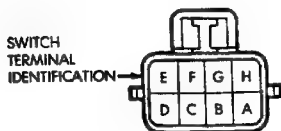


Fig. 2 TCU Removal/Installation



	B	C	A	E	G	H
P	○	○				
R			○	○		
N	○	○				
D						
3			○		○	
1-2			○			○

Fig. 3 Neutral Switch Terminals And Testing

- (5) Slide switch off manual valve shaft.

## Neutral Switch Installation And Adjustment

- (1) Disconnect shift linkage rod from shift lever on left side of transmission.
- (2) Rotate manual shift lever all the way rearward. Then rotate lever forward two detent positions to Neutral.
- (3) Install switch on manual valve shaft and install switch adjusting bolt finger tight. Do not tighten bolt at this time.
- (4) Install tabbed washer on manual valve shaft and install switch attaching nut. Tighten nut to 6.9 N·m (61 in-lbs) torque but do not bend washer lock tabs over nut at this time.
- (5) Verify that transmission is in Neutral.
- (6) Rotate switch to align neutral standard line with vertical groove on manual valve shaft (Fig. 5).
- (7) Align switch standard line with groove or flat on manual valve shaft.
- (8) Tighten switch adjusting bolt to 13 N·m (9 ft-lbs) torque.
- (9) Bend at least two washer lock tabs over switch attaching nut to secure it.
- (10) Connect shift linkage rod to shift lever on left side of case.
- (11) Connect switch wires to harness and lower vehicle.
- (12) Check switch operation. Engine should start in Park and Neutral only.

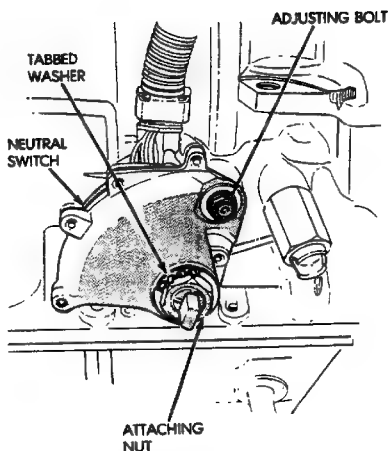


Fig. 4 Neutral Switch Removal/Installation

**VALVE BODY SOLENOIDS****Solenoid Removal And Testing**

- (1) Remove transmission oil pan drain plug and drain fluid.
- (2) Remove pan bolts and remove oil pan.
- (3) Remove oil screen bolts and remove screen (Fig. 6) and gasket. Discard the gasket.
- (4) Disconnect solenoid wire connector (Fig. 7).
- (5) If all solenoids are being removed, mark or tag wires for assembly reference before disconnecting them.
- (6) Remove bolt attaching solenoids to valve body and

remove solenoids (Fig. 8). Do not allow any valve body components to fall out when solenoids are removed.

(7) Clean oil filter and pan with solvent and dry with compressed air.

(8) Remove old sealer material from oil pan and transmission case.

**Solenoid Testing**

Test solenoid resistance with an ohmmeter.

Connect the ohmmeter leads to the solenoid mounting bracket and to the solenoid wire terminal (Fig. 9).

Solenoid resistance should be 11-15 ohms.

Replace the solenoid if resistance is above or below the specified range.

**Solenoid Installation**

(1) Position solenoids on valve body and install solenoid bolts. Tighten bolts to 10 N·m (7 ft-lbs) torque.

(2) Connect feed wires to solenoids.

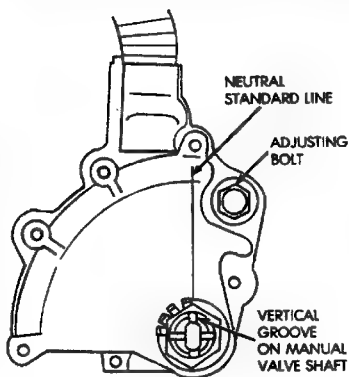


Fig. 5 Neutral Switch Adjustment

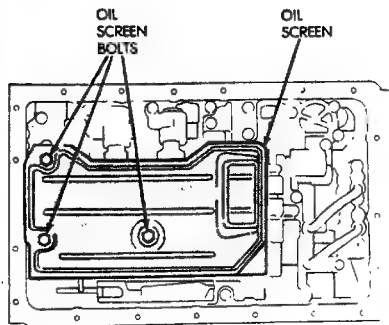


Fig. 6 Oil Screen Removal/Installation

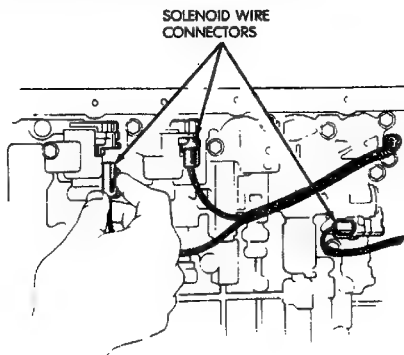


Fig. 7 Solenoid Wire Connectors

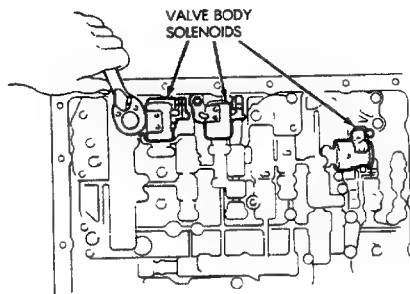


Fig. 8 Valve Body Solenoids

- (3) Install new gaskets on oil screen and install screen. Tighten screen bolts to 10 N·m (7 ft-lbs) torque.
- (4) Apply bead of Three-Bond TB 1281 or equivalent sealer to oil pan sealing surface. Sealer bead should be at least 1.0 mm (.040 in) wide.
- (5) Install oil pan on transmission. Tighten pan bolts to 7.4 N·m (65 in-lbs) torque.
- (6) Install and tighten oil pan drain plug to 20 N·m (15 ft-lbs) torque.
- (7) Fill transmission with Mopar Mercon™ or Dexron II™ transmission fluid.

## Solenoid Harness Adapter Seal Replacement

- (1) Remove oil pan and oil screen. Refer to Solenoid Removal procedure.
- (2) Disconnect solenoid wire connectors (Fig. 7).
- (3) Remove bracket securing solenoid harness adaptor (Fig. 10) to case.
- (4) Pull harness adaptor and wires out of case.
- (5) Remove and discard adapter O-ring.
- (6) Lubricate new O-ring and install it on adapter.
- (7) Install solenoid wire harness and adapter in case.
- (8) Install adapter bracket and bracket bolt.
- (9) Connect wires to solenoids.
- (10) Install oil screen and oil pan.

## VALVE BODY

Removal and installation are the only valve body service procedures covered in this section. Refer to the transmission overhaul section for valve body disassembly, cleaning, inspection and reassembly.

### Valve Body Removal

- (1) Remove oil pan plug and drain transmission fluid.
- (2) Remove oil pan and oil screen. Clean pan and screen in solvent and dry them with compressed air.

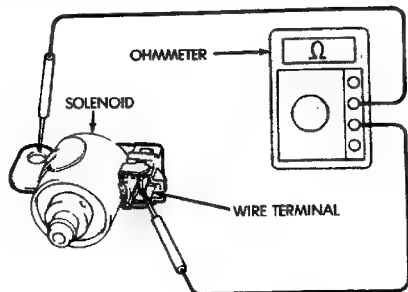


Fig. 9 Testing Valve Body Solenoid

- (3) Disconnect solenoid wire connectors (Fig. 7). Mark wires for assembly reference.
- (4) Remove valve body oil tubes (Fig. 13). Carefully pry tubes out of valve body with screwdriver.
- (5) Disconnect throttle cable from throttle cam (Fig. 13).
- (6) Remove valve body bolts. Locations for seventeen bolts are outlined in Figure 14.
- (7) Lower valve body and remove overdrive clutch accumulator springs; direct clutch accumulator spring and spacer; second brake accumulator spring and spacer (Fig. 15).
- (8) Remove valve body and check ball and spring (Fig. 16).

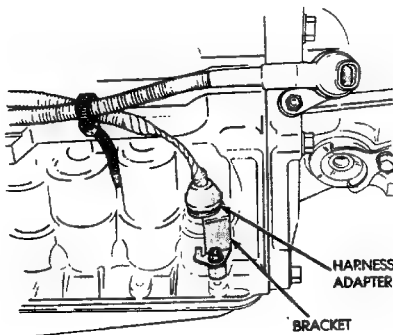


Fig. 10 Harness Adapter Removal/Installation

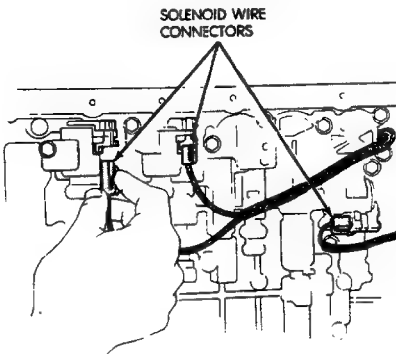


Fig. 11 Disconnect Solenoid Wires

## Valve Body Installation

- (1) Connect cable to throttle cam (Fig. 13).
- (2) Install check ball and spring (Fig. 16).
- (3) Position accumulator springs and spacers on valve body.
- (4) Align valve body manual valve with shift sector (Fig. 17) and carefully position valve body on case.
- (5) Install valve body bolts (Fig. 14). Tighten bolts evenly to 10 N·m (7 ft-lbs) torque.
- (6) Install valve body oil tubes. Be sure tube ends (L) and (M) are installed as shown in Figure 18.
- (7) Remove old sealer material from oil pan and transmission case.
- (8) Clean oil screen and oil pan with solvent (if not done previously). Dry both components with compressed air only. Do not use shop towels.

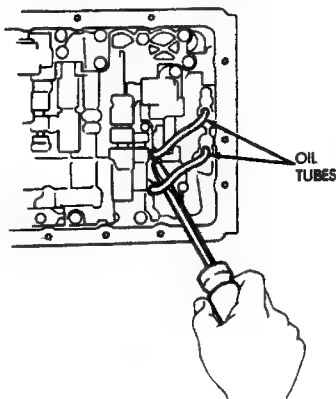


Fig. 12 Removing Valve Body Oil Tubes

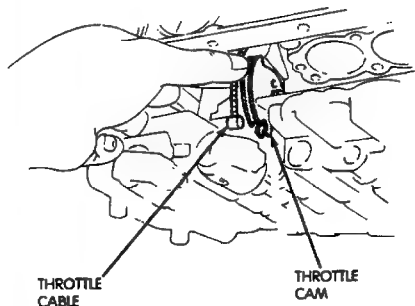


Fig. 13 Removing/Installing Throttle Cable

(9) Install new gaskets on oil screen and install screen on case. Tighten screen attaching bolts to 10 N·m (7 ft-lbs) torque.

(10) Apply bead of Three Bond TB 1281 sealer to sealing surface of oil pan. Sealer bead should be at least 1.0 mm (.040 in) wide. Then install oil pan and tighten pan bolts to 7.4 N·m (65 in-lbs) torque.

(11) Install new gasket on oil pan drain plug and install plug in pan. Tighten plug to 20 N·m (15 ft-lbs) torque.

(12) Fill transmission with Mopar Mercon™ fluid.

## MANUAL VALVE SHAFT SEAL REPLACEMENT

- (1) Remove neutral safety switch and disconnect transmission shift lever.

● = BOLT LOCATIONS

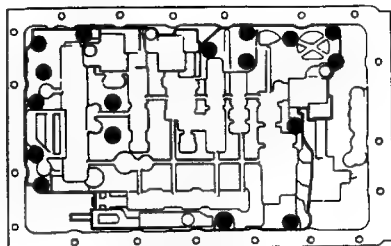


Fig. 14 Valve Body Bolt Locations

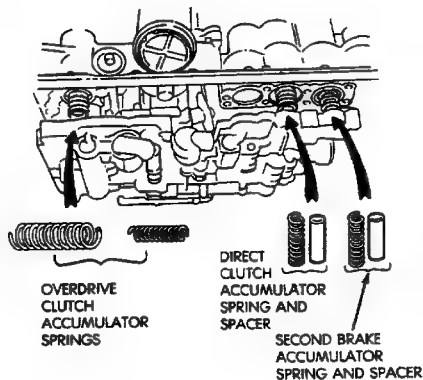
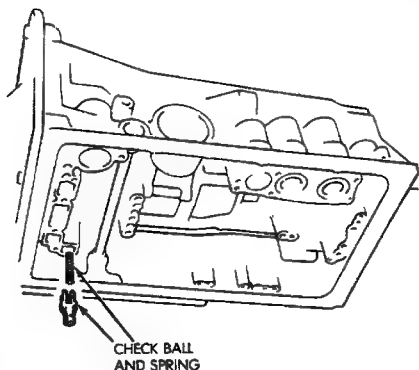


Fig. 15 Accumulator Springs

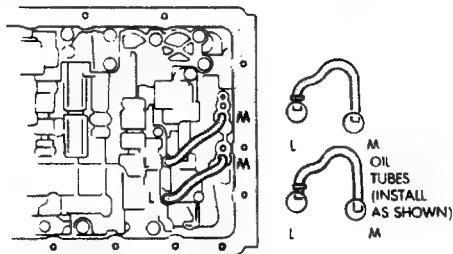


- (2) Remove oil pan and valve body.
- (3) Remove bolts attaching park rod bracket to case (Fig. 20).
- (4) Remove park rod from shift sector (Fig. 21).
- (5) Cut spacer sleeve with chisel and remove it from manual valve shaft (Fig. 22).
- (6) Remove pin from shaft and sector with pin punch.
- (7) Remove shaft and sector from case.
- (8) Pry shaft seals out of case (Fig. 23).
- (9) Inspect the manual valve shaft and sector. Replace either component if worn or damaged.

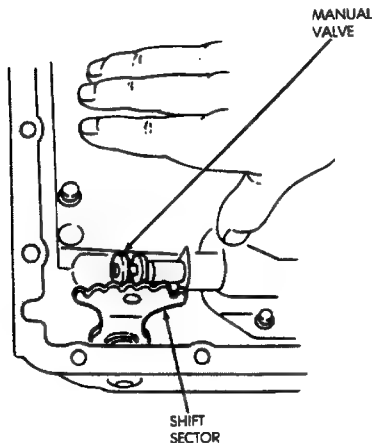
- (10) Coat replacement shaft seals with petroleum jelly and seat them in the case (Fig. 24).
- (11) Install new spacer sleeve on sector (Fig. 25).
- (12) Lubricate manual valve shaft and install it in case.
- (13) Lubricate sector and sleeve and install them on shaft.
- (14) Align hole in spacer sleeve with notch in sector. Then install shift sector roll pin. Tappin into sector and shaft and stake sleeve to sector and shaft securely.
- (15) Connect park rod to sector (Fig. 21).
- (16) Install park rod bracket (Fig. 26). Tighten bracket bolts to 10 N·m (7 ft-lbs) torque.



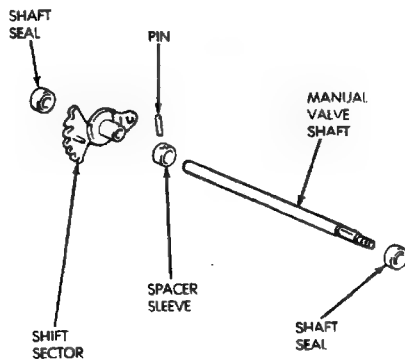
**Fig. 16 Removing/Installing Valve Body Check Ball And Spring**



**Fig. 18 Installing Valve Body Oil Tubes**



**Fig. 17 Align Shift Sector And Manual Valve**



**Fig. 19 Manual Valve Shaft And Seals**



(17) Install valve body, oil screen, oil pan and neutral switch.

## THROTTLE CABLE REPLACEMENT-ADJUSTMENT

### Throttle Cable Removal

(1) In engine compartment, disconnect cable from throttle linkage. Then compress cable mounting ears and remove cable from linkage bracket.

(2) Raise vehicle.

(3) Remove transmission oil pan.

(4) Disengage cable from throttle valve cam (Fig. 27).

(5) Remove cable bracket bolt and remove cable and bracket from case (Fig. 28).

(6) Remove and discard cable seal.

### Throttle Cable Installation

(1) Lubricate and install new seal on cable.

(2) Insert cable in transmission case.

(3) Attach cable to throttle cam (Fig. 27).

(4) Install cable bracket on case and tighten attaching bolt to 10 N·m (7 ft-lbs) torque (Fig. 28).

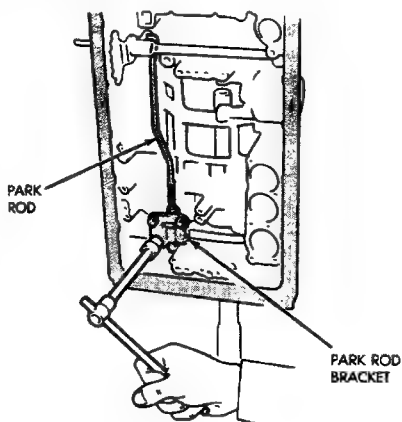


Fig. 20 Removing/Installing Park Rod Bracket

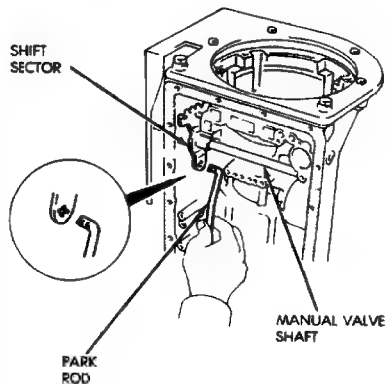


Fig. 21 Removing/Installing Park Rod

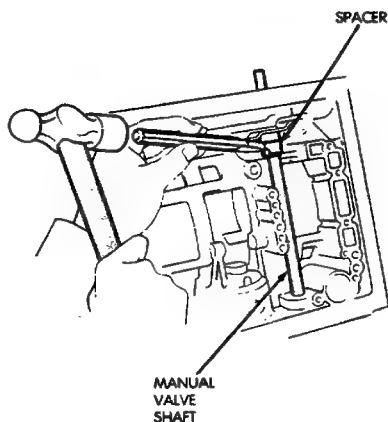
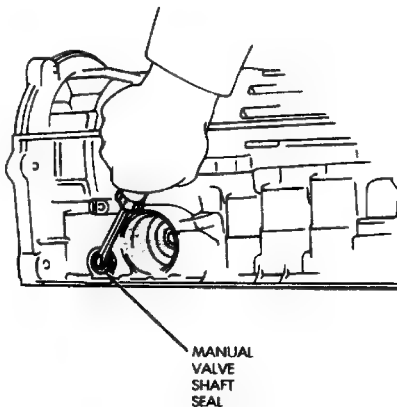


Fig. 22 Cutting Spacer Sleeve



18 Fig. 23 Removing Manual Valve Shaft Seals

(5) Remove old sealer material from oil pan and transmission case. Clean oil pan with solvent and dry it with compressed air.

(6) Apply bead of Three Bond TB 1281 sealer to oil pan sealing surface. Sealer bead should be at least 1.0 mm (.040 in) wide. Then install pan and tighten pan bolts to 7.4 N·m (65 in-lbs) torque.

(7) Install new gasket on oil pan drain plug. Install and tighten plug to 20 N·m (15 ft-lbs) torque.

(8) Connect cable to engine bracket and throttle linkage.

(9) Fill transmission with Mopar Mercon™.

(10) Adjust the cable as outlined in the Line Pressure Cable Adjustment procedure.

## Throttle Cable Adjustment

(1) Turn ignition switch to Off position.

(2) Fully retract cable plunger. Press cable button all the way down. Then push cable plunger inward (Fig. 29).

(3) Rotate primary throttle lever to wide open throttle position (Fig. 30).

(4) Hold primary throttle lever in wide open position and let cable plunger extend. Release lever when plunger is fully extended. Cable is now adjusted.

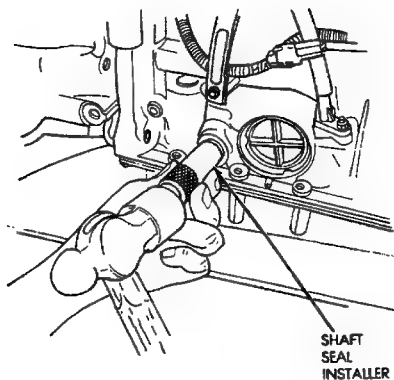


Fig. 24 Installing Manual Valve Shaft Seals

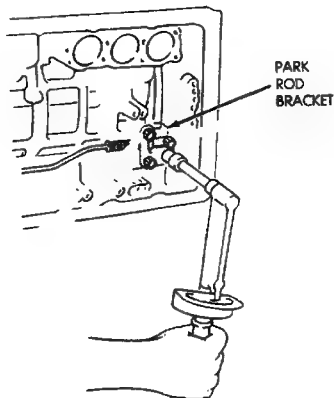


Fig. 26 Installing Park Rod Bracket

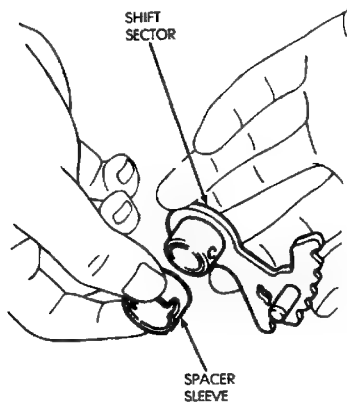


Fig. 25 Installing Spacer Sleeve On Sector

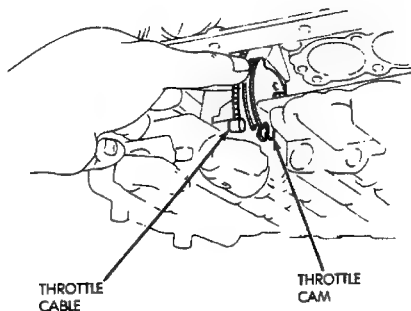


Fig. 27 Removing/Installing Throttle Cable

## ACCUMULATOR PISTONS AND SPRINGS

### Accumulator Piston and Spring Removal

(1) Remove valve body. Refer to procedure in this section.

(2) Remove accumulator pistons with compressed air (Fig. 31). Apply air through small feed hole next to each piston bore. Catch each piston in a shop towel as it exits the bore.

**CAUTION:** Use only enough air pressure to ease each piston out of the bore. In addition, remove the pistons

one at a time and tag the pistons and springs for assembly reference. Do not intermix them.

(3) Remove and discard piston O-ring seals. Then clean the pistons and springs with solvent.

(4) Inspect the pistons and springs and the piston bores in the case. Replace worn damaged pistons. Replace broken, collapsed or distorted springs. Replace the case if the piston bores are damaged.

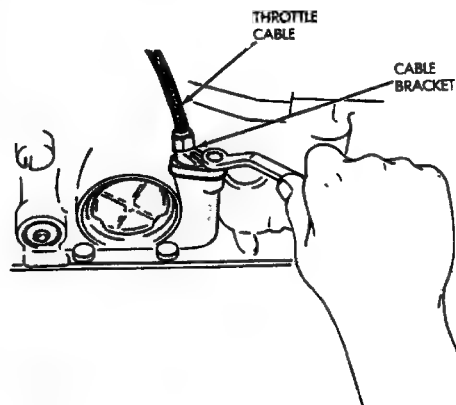


Fig. 28 Removing/Installing Cable And Bracket

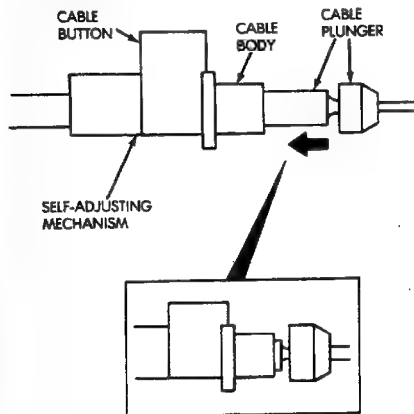


Fig. 29 Retract Throttle Cable Plunger

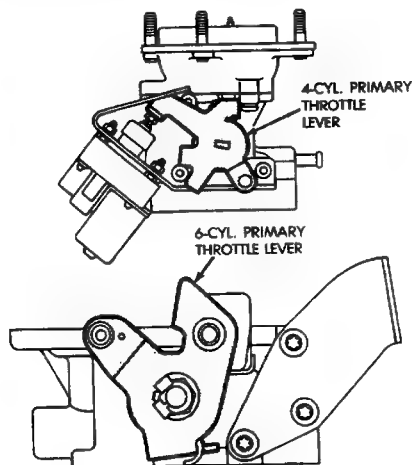


Fig. 30 Rotate Primary Throttle Lever To Wide Open Position

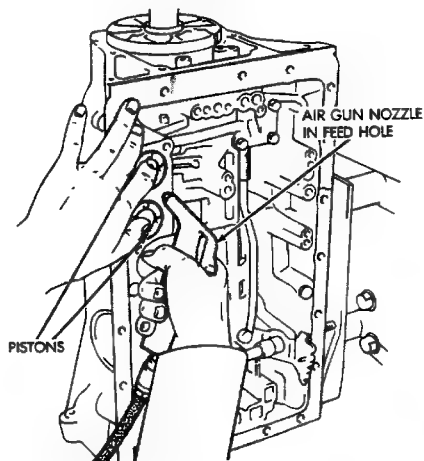


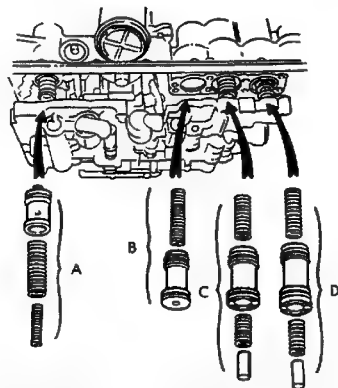
Fig. 31 Removing Accumulator Pistons

- (5) Install new O-ring seals on pistons. Lubricate seals and pistons and piston bores with transmission fluid.
- (6) Install pistons and springs (Fig. 32).
- (7) Install valve body, oil screen and oil pan.

## SECOND COAST BRAKE SERVO

### Servo Overhaul

- (1) Remove valve body as outlined in this section.
- (2) Remove servo piston cover snap ring with snap ring pliers (Fig. 33).
- (3) Remove servo piston and cover with compressed air. Apply compressed air through oil hole in servo boss to ease piston out of bore (Fig. 34).
- (4) Remove and discard seal and O-rings from cover and piston (Fig. 35). Inspect E-ring, piston, spring and retainer, piston rod and piston spring. Replace worn or damaged parts.
- (5) Install new seals on cover and piston.
- (6) Lubricate servo components with transmission fluid.
- (7) Assemble and install servo components in case. Be sure servo piston rod is properly engaged in the second coast brake band.
- (8) Compress cover and piston and install cover snap ring.
- (9) Install valve body, oil screen and oil pan.



- A. OVERDRIVE CLUTCH ACCUMULATOR PISTON AND SPRINGS
- B. OVERDRIVE BRAKE ACCUMULATOR PISTON AND SPRINGS
- C. SECOND CLUTCH ACCUMULATOR PISTON, SPRINGS AND SPACER
- D. SECOND CLUTCH ACCUMULATOR PISTON, SPRINGS AND SPACER

NOTE: PISTON HEIGHT AND DIAMETER ARE OUTLINED IN THE SPECIFICATIONS SECTION.

## PARK ROD AND PAWL

### Park Rod and Pawl Removal

- (1) Remove valve body as outlined in this section.
- (2) Remove bolts attaching park rod bracket to case (Fig. 36).
- (3) Remove park rod from manual valve shaft sector (Fig. 37).
- (4) Remove park rod.

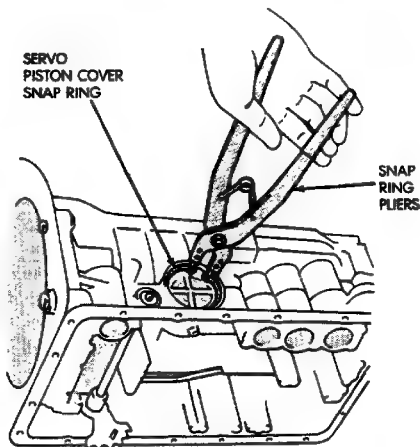
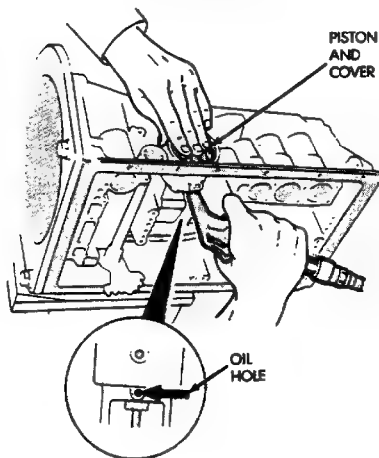


Fig. 33 Removing/Installing Servo Piston Cover Snap Ring



21 Fig. 34 Removing Servo Cover And Piston

- (5) Remove park pawl, pin and spring (Fig. 38).
- (6) Examine park rod, pawl, pin and spring. Replace any component that is worn or damaged.
- (7) Install pawl in case. Insert pin and install spring.
- (8) Install park rod and bracket (Fig. 36). Tighten bracket bolts to 10 N·m (7 ft-lbs) torque.
- (9) Install valve body, oil screen and oil pan as outlined in this section.

## EXTENSION/ADAPTOR HOUSING SEAL REPLACEMENT

- (1) Raise vehicle.

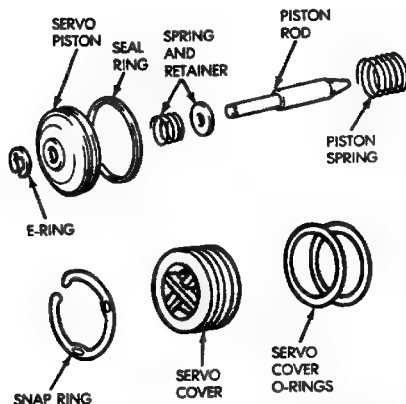


Fig. 35 Second Coast Brake Servo Components

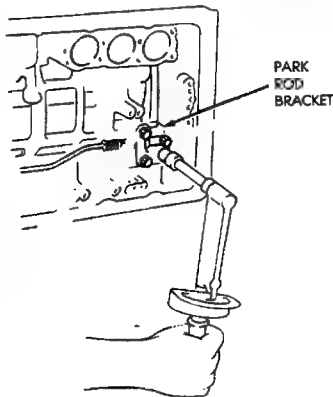


Fig. 36 Removing/Installing Park Rod Bracket

- (2) On 2WD or 4WD models, disconnect or remove components necessary to gain access to the seal (e.g. propeller shaft, crossmember, shift linkage, transfer case, exhaust components, hoses, wires).

- (3) On 2WD models, remove seal from adaptor housing (Fig. 39).

- (4) On 4WD model, remove dust shield and remove seal from extension housing (Fig. 39).

- (5) Install new seal with appropriate size seal installer. On 4WD models, also install dust shield.

- (6) Reinstall components removed to gain access to seal.

- (7) Top off transmission fluid if necessary.

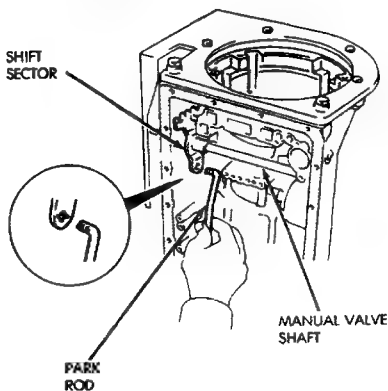


Fig. 37 Removing/Installing Park Rod

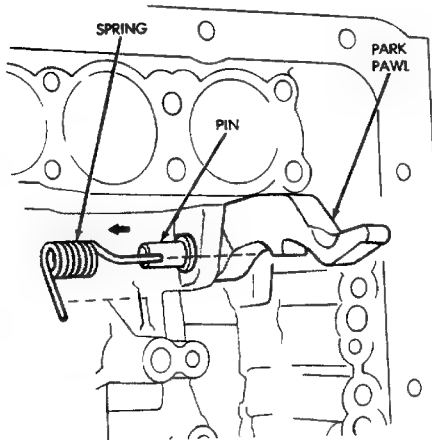


Fig. 38 Removing/Installing Park Pawl-Pin-Spring

## SPEED SENSOR

### Speed Sensor Testing

Test the speed sensor with an ohmmeter. Place the ohmmeter leads on the terminals in the sensor connector (Fig. 40).

Rotate the transmission output shaft and observe the ohmmeter needle. The needle should deflect indicating the switch is opening/closing as the rotor moves past the sensor (Fig. 40). Replace the sensor if the ohmmeter does not display any kind of reading.

If a digital ohmmeter is being used, the sensor should generate an ohmmeter readout each time the switch opens and closes.

### Speed Sensor Replacement

- (1) Disconnect sensor wire harness connector.
- (2) Remove sensor retainer bolt and remove sensor (Fig. 41).
- (3) Remove and discard speed sensor O-ring.
- (4) Install new O-ring on speed sensor and install sensor in transmission case.
- (5) Install sensor bracket and retainer bolt. Tighten bolt to 7.4 N·m (65 in-lbs) torque.
- (6) Connect sensor wire harness connector.

## SPEED SENSOR ROTOR-SPEEDOMETER DRIVE GEAR

### Rotor-Drive Gear Removal

- (1) Raise vehicle.
- (2) Remove components necessary to gain access to rotor and drive gear (e.g. propeller shaft, transfer case, crossmember, shift linkage).

- (3) Disconnect speedometer cable and/or speed sensor.
- (4) Remove extension or adaptor housing.
- (5) Remove speedometer drive gear snap ring (Fig. 42).
- (6) Remove the speedometer drive gear and spacer (if equipped).
- (7) Remove rotor by carefully prying it off output shaft with wood dowel or hammer handle (Fig. 43).
- (8) Clean sealing surfaces of transmission case and extension/adaptor housing.

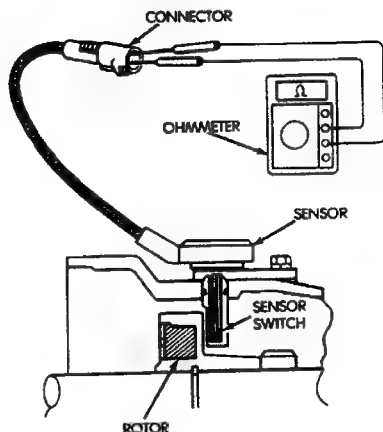


Fig. 40 Speed Sensor Testing

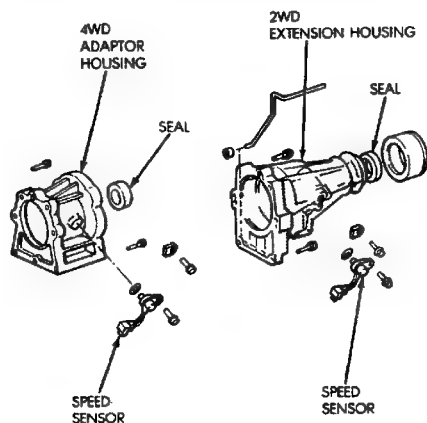


Fig. 39 Adaptor/Extension Housing Seals

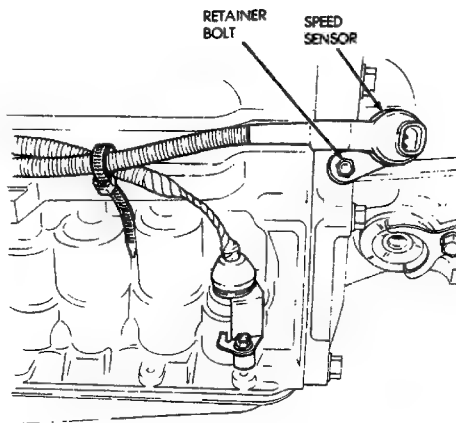


Fig. 41 Speed Sensor Removal/Installation

## Rotor-Drive Gear Installation

- (1) Install rotor, spacer (if equipped) and drive gear on output shaft. Then install drive gear snap ring (Fig. 42).
- (2) Apply bead of RTV sealer, to transmission case sealing surface and install extension/adaptor housing on case.
- (3) Tighten extension/adaptor housing bolts to 34 N·m (25 ft-lbs) torque.
- (4) Install components removed to gain access to rotor and drive gear.

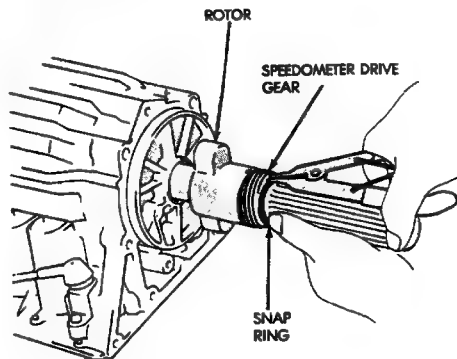


Fig. 42 Removing/Installation Speedometer Drive Gear

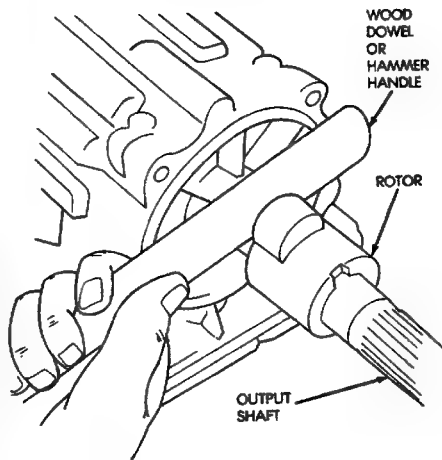


Fig. 43 Removing Speed Sensor Rotor

## TPS SERVICE

A separate throttle position sensor is used for automatic transmission applications. The sensor is attached to the base of the throttle body. Refer to Group 14 for TPS service and adjustment.

## SHIFT CABLE ADJUSTMENT

- (1) Shift transmission into Park.
- (2) Raise vehicle.
- (3) Release cable adjuster clamp to unlock cable (Fig. 47).
- (4) Unsnap cable from cable bracket (Fig. 47).
- (5) Move transmission shift lever all the way rearward into Park detent. Lever is on manual valve shaft at left side of case.
- (6) Verify positive engagement of park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
- (7) Snap cable into cable bracket.
- (8) Lock shaft cable by pressing cable adjuster clamp down until it snaps into place.
- (9) Check engine starting. Engine should start only in Park and Neutral.
- (10) Lower automobile.

## PARK LOCK CABLE ADJUSTMENT

- (1) Shift transmission into Park.
- (2) Turn ignition switch to Lock position.
- (3) Remove shift lever bezel and console screws. Raise bezel and console for access to cable.
- (4) Pull cable lock button up to release cable (Fig. 48).
- (5) Pull cable forward. Then release cable and press cable lock button down until it snaps in place.
- (6) Check adjustment as follows:

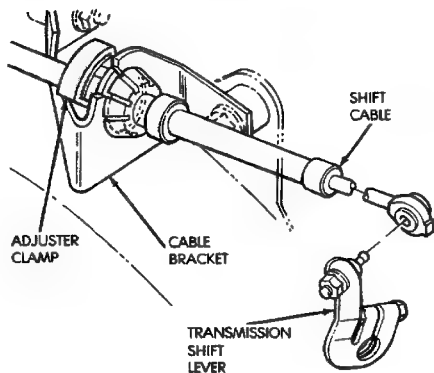


Fig. 47 Shift Cable Adjustment



(a) Check movement of release shift handle button (floor shift) or release lever (column shift). You should not be able to press button inward or move column lever.

(b) Turn ignition switch to On position.

(c) Press floor shift lever release button or move column lever. Then shift into Neutral. If cable adjustment is correct, ignition switch can not be turned to Lock position. Perform same check with transmission in D range.

(7) Move shift lever back to Park and check ignition switch operation. You should be able to turn switch to Lock position and shift lever release button/lever should not move.

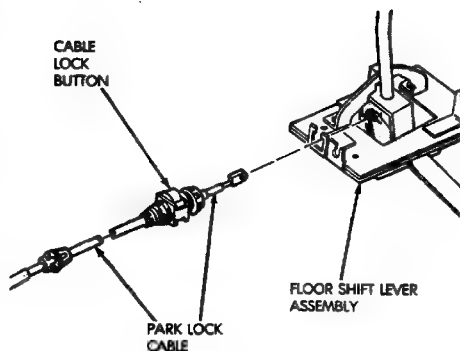


Fig. 48 Park Lock Cable

## TRANSMISSION AND TORQUE CONVERTER REMOVAL

- (1) Raise vehicle.
- (2) Drain transmission fluid and reinstall oil pan drain plug.
- (3) Remove upper half of transmission fill tube (Fig. 49).
- (4) Disconnect cooler lines at transmission. Cooler lines have quick-disconnect fittings. Press fitting release tabs and pull cooler line and fitting out of case.
- (5) Support engine with safety stand and support transmission with jack.
- (6) Disconnect or remove following: transmission/transfer case shift linkage; necessary exhaust components; speedometer cable; front/rear propeller shaft; transmission wire harnesses; transfer case vacuum and wire harnesses.
- (7) Remove rear crossmember.
- (8) Disconnect transmission throttle cable at engine.
- (9) Disconnect necessary vacuum and fluid hoses.
- (10) Remove starter motor.
- (11) Remove converter-to-drive plate bolts.
- (12) Remove converter housing-to-engine bolts.

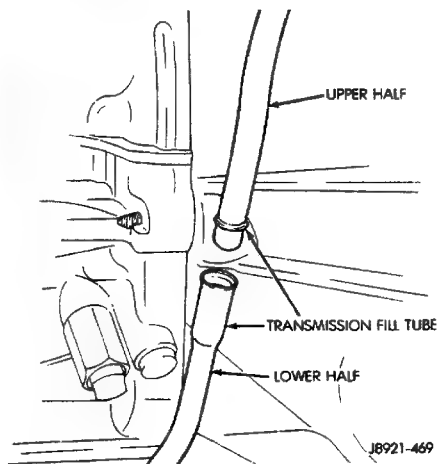


Fig. 49 Two-Piece Transmission Fill Tube

(13) Secure transmission (and transfer case assembly on 4WD models) to transmission jack with safety chains. Then remove transmission.

(14) Remove torque converter if converter or oil pump seal are to be serviced.

(15) Remove transfer case if transmission is to be overhauled.

## TORQUE CONVERTER STATOR CLUTCH INSPECTION

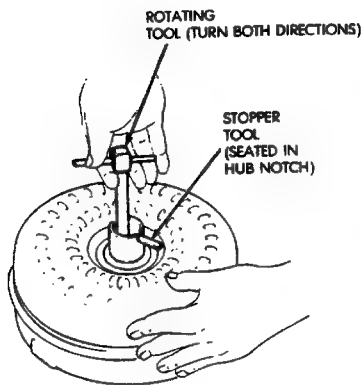
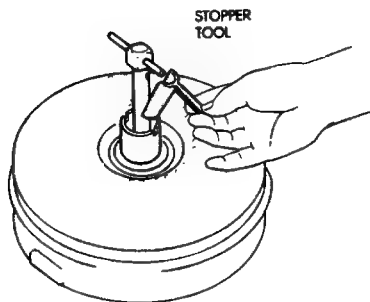
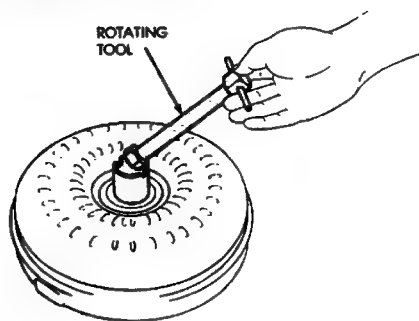
- (1) Insert rotating tool B.Vi. FM. 36 into converter hub and seat tool in one-way clutch (Fig. 50).
- (2) Insert stopper tool B.Vi. FM. 37 in one converter hub notch and into outer race of rotating tool.
- (3) Turn rotating tool clockwise. Converter clutch should rotate freely and smoothly. Less than 2.5 N·m (22 in-lbs) of torque should be required to rotate clutch in clockwise direction.
- (4) Turn rotating tool in counterclockwise direction. Converter clutch should lock.
- (5) Replace converter if clutch binds or will not lock.

## OIL PUMP SEAL REPLACEMENT

- (1) Remove converter.
- (2) Remove old seal. Use blunt punch to collapse seal and pry seal out of pump housing. Do not scratch or damage seal bore.
- (3) Lubricate lip of new seal with petroleum jelly and install seal in pump (Fig. 51).
- (4) Align and install torque converter.

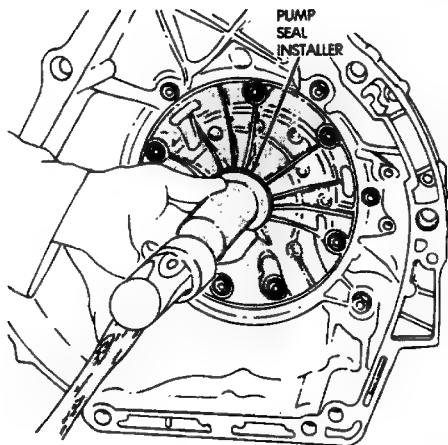
## TRANSMISSION AND TORQUE CONVERTER INSTALLATION

- (1) Mount transmission on transmission jack.
- (2) Install torque converter on transmission.
- (3) On 4WD models, install transfer case on transmission.
- (4) Secure transmission (and transfer case assembly on 4WD models) to jack with safety chains.
- (5) Align and position transmission and converter on engine.
- (6) Install converter housing-to-engine bolts.
- (7) Install converter-to-drive plate bolts.
- (8) Install and connect starter motor.
- (9) On 4WD models, connect transfer case shift linkage and vacuum hoses.
- (10) Connect exhaust components.



**Fig. 50 Checking Converter Clutch Operation**

- (11) Install rear crossmember.
- (12) Connect speedometer cable and neutral switch wires.
- (13) Align and connect front and rear propeller shafts.
- (14) Connect transmission wire harnesses and transfer case vacuum and wire harnesses.
- (15) Connect transmission cooler lines.
- (16) Connect transmission throttle valve cable at engine.
- (17) Install new O-ring seal on upper half of transmission fill tube. Then connect upper and lower tube halves.
- (18) Lower vehicle.
- (19) Fill transmission with Mopar Mercon™ automatic transmission fluid.



**Fig. 51 Installing Oil Pump Seal**

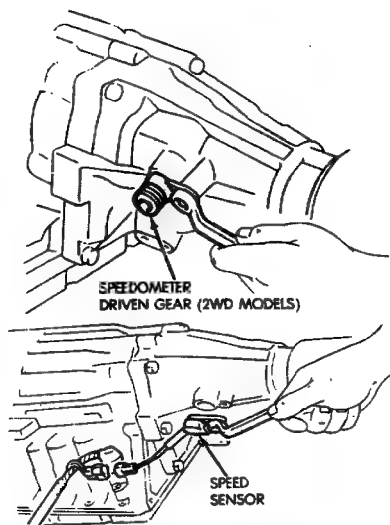
# TRANSMISSION OVERHAUL

## OVERHAUL SERVICE TOOLS

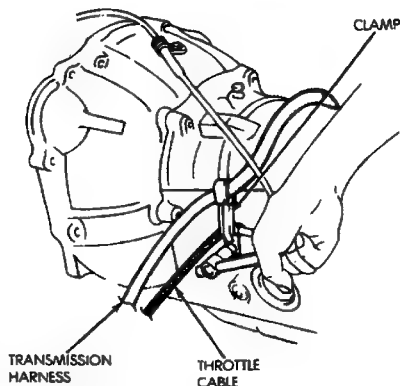
The special tools needed to overhaul the AW 4 transmission are provided in tool kit 6294 (B.Vi.FM. 23). However, pressure test port adapter 7554 is not included in this kit and will have to be ordered separately. The overhaul tool kit and test port adapter are available through the parts division and dealer special tool program.

## TRANSMISSION DISASSEMBLY

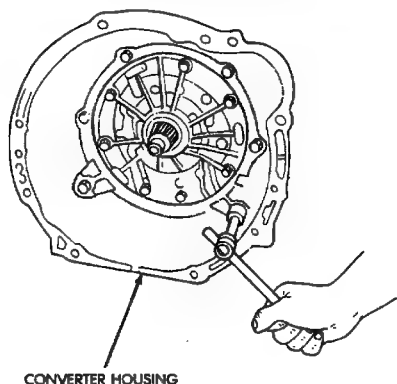
- (1) Remove torque converter.
- (2) Remove dipstick and both halves of oil filler tube.
- (3) Remove clamp attaching wire harness and throttle pressure cable (Fig. 1) to transmission.
- (4) Remove shift lever from manual valve shaft at left side of transmission.
- (5) Remove neutral switch.
- (6) Remove speedometer driven gear (if equipped) and remove speed sensor (Fig. 2).
- (7) Remove converter housing bolts and remove housing (Fig. 3) from case.
- (8) Remove extension housing or adapter housing.
- (9) On 2WD models, measure inside diameter of extension housing bushing with cylinder bore gauge or inside micrometer. Diameter should be 38.09 mm



**Fig. 2 Removing/Installing Speedometer Driven Gear And Speed Sensor**



**Fig. 1 Remove Harness And Cable Clamp**



**Fig. 3 Removing/Installing Converter Housing**

(1.4996 in) or less. Replace housing as assembly if inside diameter exceeds specified limit.

(10) Remove the speedometer drive gear snap ring and remove the gear and gear spacer if equipped (Fig. 5).

(11) Remove speed sensor rotor and key. Use wood dowel or hammer handle to loosen and remove rotor (Fig. 6).

(12) Remove transmission oil pan, oil screen and screen gaskets (Fig. 7). Then mount transmission in holding fixture.

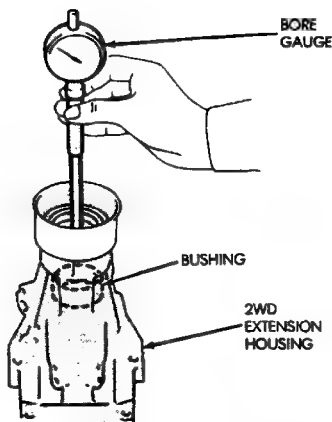
(13) Remove valve body oil feed tubes (Fig. 8).

(14) Disconnect solenoid wires (Fig. 9).

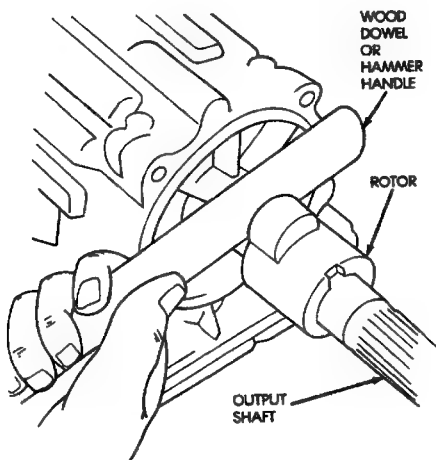
(15) Remove harness bracket bolt and remove harness and bracket Fig. 10).

(16) Remove valve body bolts (Fig. 11).

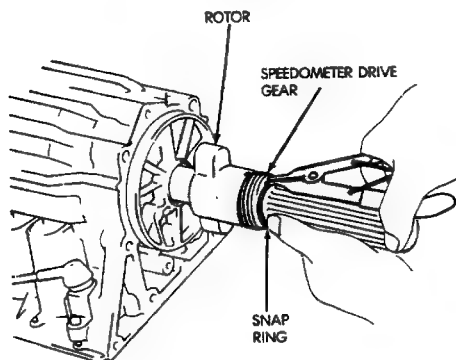
(17) Disconnect throttle cable from throttle cam (Fig. 12).



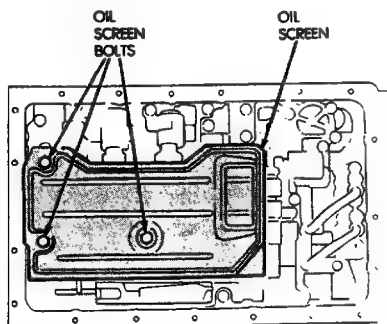
**Fig. 4 Checking Bushing Diameter—2WD Extension Housing**



**Fig. 6 Removing Speed Sensor Rotor**



**Fig. 5 Removing Speed Sensor And Speedometer Drive Gear**



**Fig. 7 Removing Oil Screen**

(18) Remove valve body from case. Then remove accumulator springs, spacers and check ball and spring (Fig. 13).

(19) Remove second brake and clutch accumulator pistons with compressed air (Fig. 14). Apply air pressure through feed port and ease the pistons out of the bore.

(20) Remove overdrive brake accumulator piston with compressed air (Fig. 14).

(21) Remove overdrive clutch accumulator piston with compressed air (Fig. 14).

(22) Remove throttle cable.

(23) Remove oil pump bolts and remove pump with bridge-type puller B.Vi. FM. 25 (Fig. 15).

(24) Remove race from oil pump (Fig. 16).

(25) Remove fourth gear overdrive planetary gear and overdrive direct clutch assembly (Fig. 17).

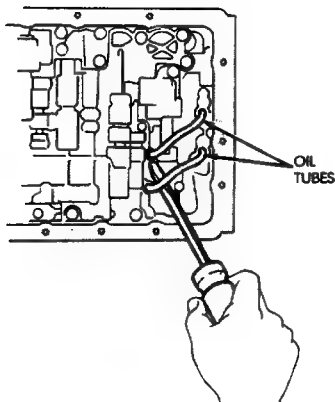
(26) Remove race from fourth gear overdrive planetary (Fig. 18).

(27) Remove thrust bearing, race and overdrive planetary ring gear (Fig. 19).

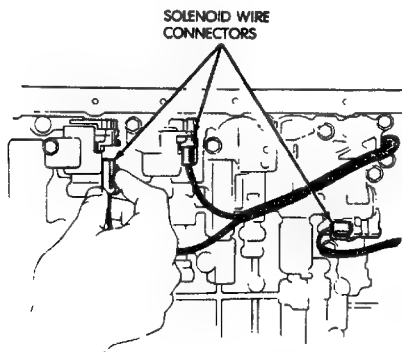
(28) Measure stroke length of overdrive brake piston as follows:

(a) Mount dial indicator on case (Fig. 20).

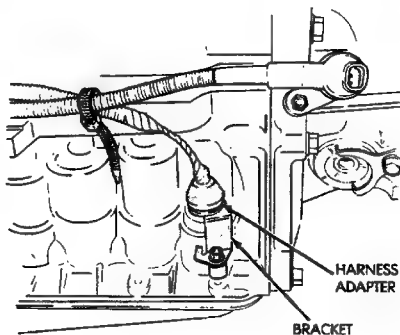
(b) Mount gauge tool B.Vi. FM. 35 so it contacts piston (Fig. 20).



**Fig. 8 Removing Valve Body Oil Tubes**

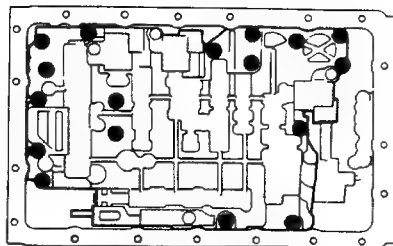


**Fig. 9 Solenoid Wires**



**Fig. 10 Removing Bracket And Harness**

● = BOLT LOCATIONS



**Fig. 11 Valve Body Bolt Locations**

(c) Apply 57-114 psi air pressure through piston apply port and note piston stroke on dial indicator. Stroke length should be: 1.40 - 1.70 mm (.055 to .0699 in) on 6-cylinder models and 1.32 - 1.62 mm (.0520 to .0638 in) on 4-cylinder models.

(d) If stroke is not within limits, replace brake pack retainer. Select required retainer from Overdrive Brake Retainer Selection chart in Specifications section.

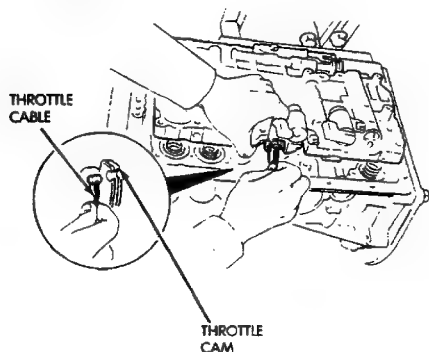
(29) Remove overdrive brake snap ring (Fig. 21).

(30) Remove overdrive brake discs and plates (Fig. 22). Then measure disc thickness with a micrometer. Minimum disc thickness is 1.84 mm (.0724 in). Replace discs if thickness is less than specified.

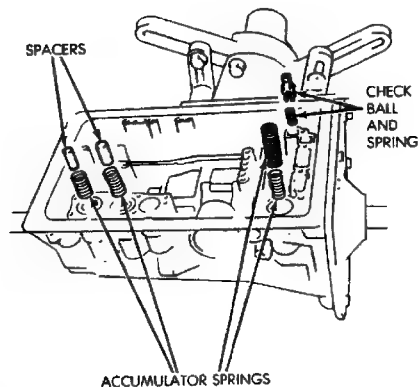
(31) Remove overdrive support lower race (43) and upper bearing and race assembly (Fig. 23).

(32) Remove overdrive support bolts (Fig. 24).

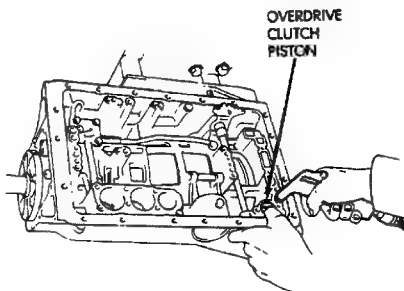
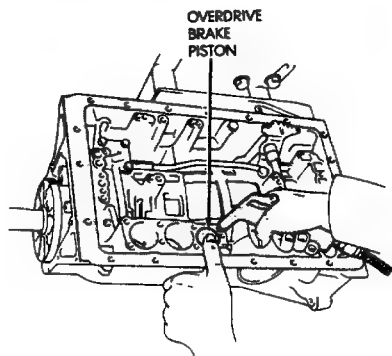
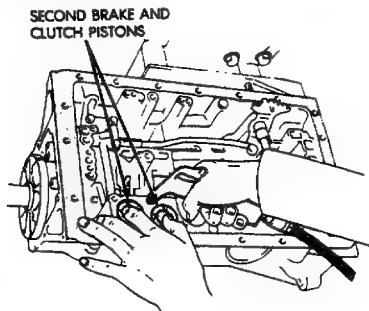
(33) Remove overdrive support snap ring with tool B.Vi. FM. 29 (Fig. 25).



**Fig. 12 Removing Throttle Cable**



**Fig. 13 Removing Accumulator Springs-Spacers-Check Ball**



**Fig. 14 Removing Accumulator Pistons**

(34) Remove overdrive support (Fig. 26) with bridge-type puller tool B.Vi. FM. 25.

(35) Remove race from hub of overdrive support (Fig. 27).

(36) Measure stroke length of second coast brake piston rod as follows:

(a) Make reference mark on piston rod (Fig. 28) as shown.

(b) Apply 57-114 psi air pressure through piston feed hole and check stroke length with gauge B.Vi. FM. 40/41 (Fig. 28).

(c) Stroke length should be 1.5-to-3.0 mm (.059 to .118 in).

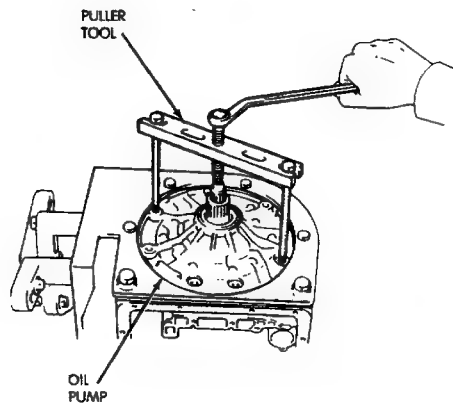


Fig. 15 Removing Oil Pump

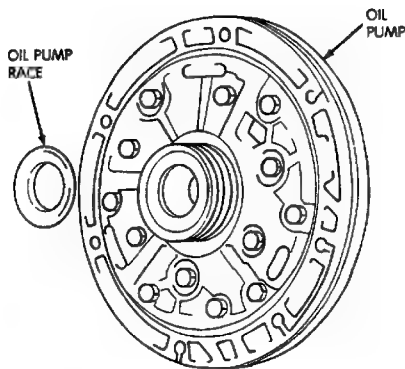


Fig. 16 Removing Oil Pump Race

(d) If stroke length is incorrect, install new piston rod and recheck stroke. If stroke is still incorrect, replace second coast brake band.

(e) Replacement piston rods are available in two different lengths which are: 71.4 mm (2.811 in) and 72.9 mm (2.870 in).

(37) Remove second coast brake piston snap ring with tool B.Vi. FM. 29. Then remove piston cover and piston assembly with compressed air applied through piston feed hole (Fig. 29).

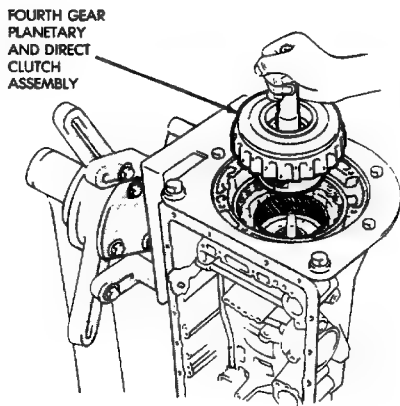


Fig. 17 Removing Fourth Gear Planetary And Direct Clutch Assembly

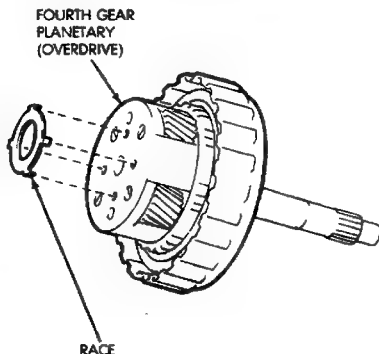
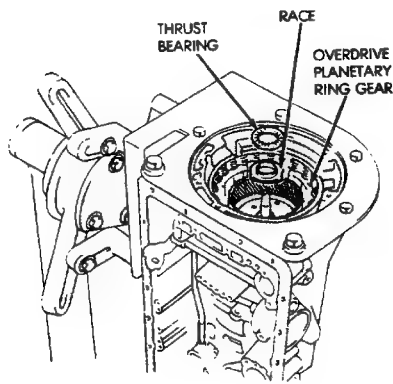


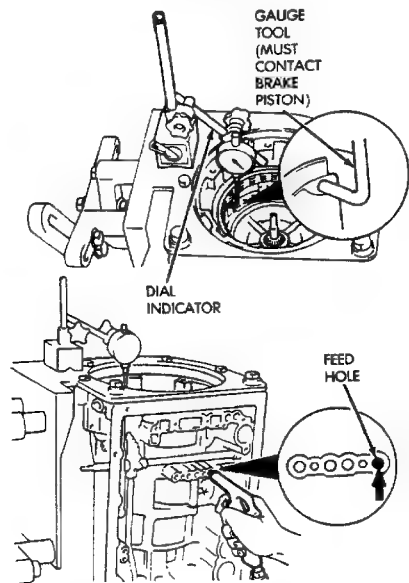
Fig. 18 Remove Fourth Gear Planetary Race



- (38) Disassemble second coast brake piston (Fig. 30).
- (39) Remove direct and forward clutch assembly (Fig. 31).
- (40) Remove thrust bearing and race from clutch hub (Fig. 32).

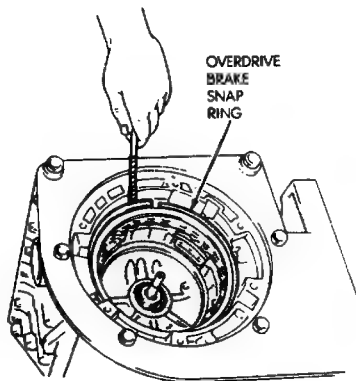


**Fig. 19 Remove Bearing, Race And Planetary Ring Gear**

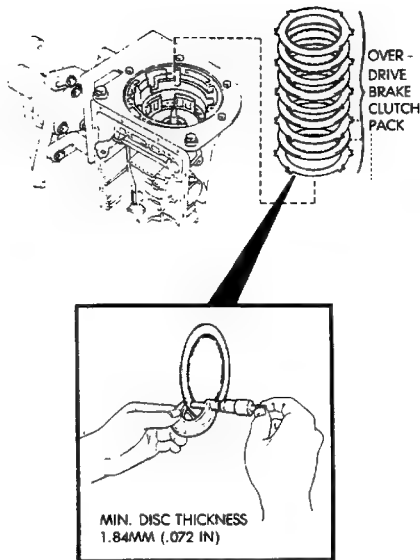


**Fig. 20 Measuring Overdrive Brake Piston Stroke**

- (41) Remove the second coast brake band E-ring from band pin and remove brake band (Fig. 33).
- (42) Remove front planetary ring gear front bearing race and remove front planetary ring gear (Fig. 34).



**Fig. 21 Remove Overdrive Brake Snap Ring**



**Fig. 22 Remove/Measure Overdrive Brake Disc Thickness**

(43) Remove thrust bearing and rear race from ring gear (Fig. 35).

(44) Remove planetary thrust race (Fig. 36).

(45) Relieve load on planetary snap ring as follows: Loosen transmission holding fixture. Turn transmission over and allow output shaft to support transmission weight. Place wood blocks under shaft to protect splines (Fig. 36).

(46) Remove planetary snap ring and remove planetary gear (Fig. 37).

(47) Remove sun gear, input drum and one-way clutch as assembly (Fig. 38).

(48) Measure second brake clutch pack clearance (Fig. 39). Clearance should be: .62 to 1.98 mm (.0244 to .0780 in) on six-cyl. transmissions and .89 to 2.15 mm (.0350

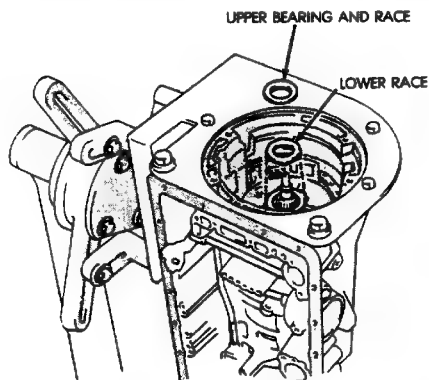
to .0846 in) on four-cyl. transmissions. Replace discs if clearance is not within specifications.

(49) Remove second brake clutch pack snap ring (Fig. 40).

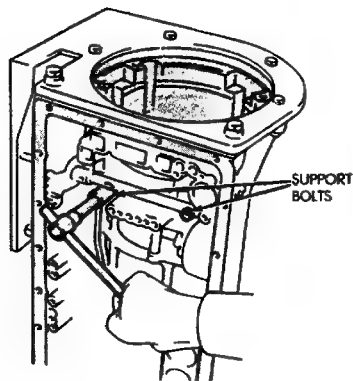
(50) Remove second brake clutch pack (Fig. 41). Measure disc thickness with micrometer. Minimum thickness should be 1.84 mm (.0724 in). Replace discs if not within specifications.

(51) Remove bolts attaching park rod bracket to case. Then disconnect park rod from manual shaft lever and remove rod and bracket (Fig. 42).

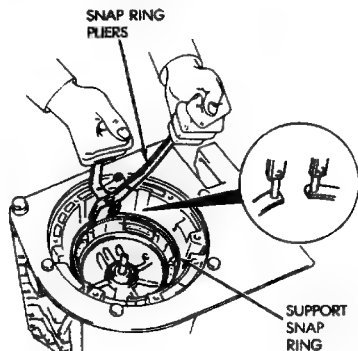
(52) Remove park pawl spring, pin and pawl (Fig. 43).



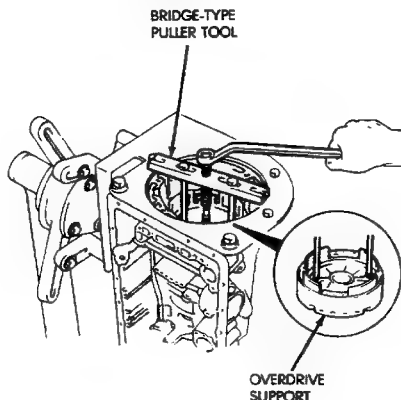
**Fig. 23 Remove Overdrive Support Bearing/Races**



**Fig. 24 Remove Overdrive Support Bolts**

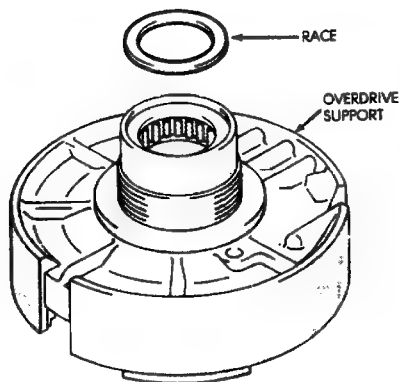


**Fig. 25 Removing/Installing Overdrive Support Snap Ring**

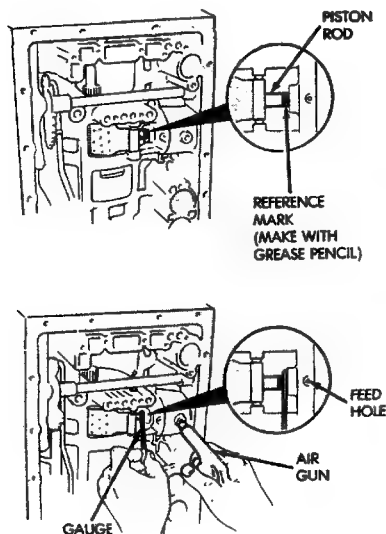


**Fig. 26 Removing Overdrive Support**

(53) Measure clearance of first-reverse brake clutch pack (Fig. 44). Clearance should be: .70 to 2.00 mm (.0276 to .0787 in) on 6-cyl. transmissions and .60 to 1.74 mm (.0236 to .0685 in) on 4-cyl. transmissions. Replace discs if clearance is not as specified.



**Fig. 27 Remove Overdrive Support Race**

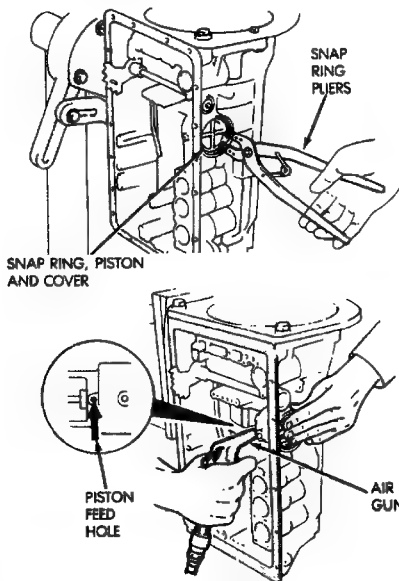


**Fig. 28 Measuring Second Coast Brake Piston Rod Stroke**

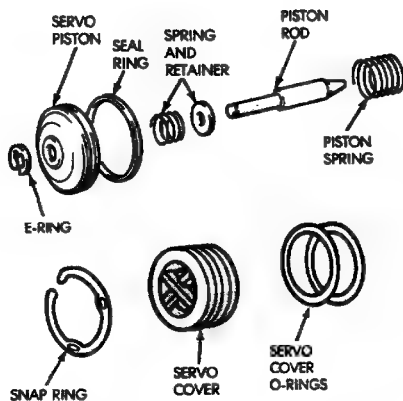
(54) Remove second brake piston sleeve (Fig. 45). Cover remover tool with tape to avoid damaging case.

(55) Remove rear planetary gear, second brake drum and output shaft as an assembly (Fig. 46).

(56) Remove planetary and brake drum thrust bearing and race assembly (Fig. 47).



**Fig. 29 Removing Second Coast Brake Cover And Piston**



**Fig. 30 Second Coast Brake Piston Components**

(57) Remove second brake drum gasket from case with gasket scraper or screwdriver (Fig. 48).

(58) Measure inside diameter of transmission case rear bushing with bore gauge or inside micrometer (Fig. 49). Maximum allowable diameter is 38.18 mm (1.5031 in). Replace transmission case if bushing I.D. is greater than specified. Bushing is not serviceable.

## CLEANING-INSPECTION

Clean the transmission components with solvent and dry them with compressed air only. Do not use shop towels or rags.

Blow compressed air through all oil feed passages and channels to be sure they are clear. Inspect the transmission components for wear and damage. Replace components that are damaged or worn beyond the limits specified in the individual overhaul procedures.

Replace all O-rings, gaskets and seals. These components are not reusable. Also replace any snap ring that is distorted or damaged.

During overhaul assembly operations, lubricate the transmission components with Jeep or Mopar Mercon™ automatic transmission fluid or petroleum jelly as indicated. Petroleum jelly should be used to prelubricate thrust bearings, washers and races. It can also be used to hold parts in position during assembly.

Soak replacement clutch and brake pack components in transmission fluid for at least 30 minutes before installation.

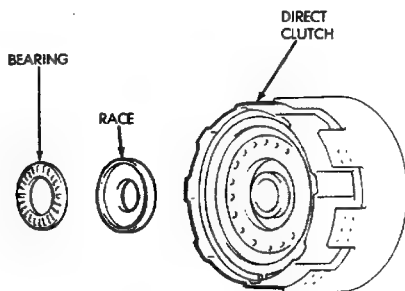


Fig. 32 Remove Bearing And Race From Clutch Hub

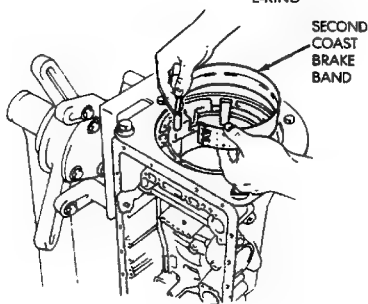
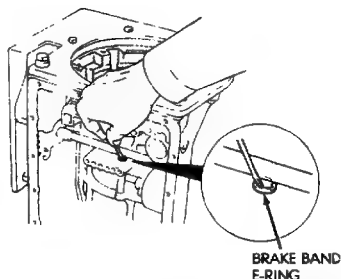


Fig. 33 Removing Second Coast Brake Band

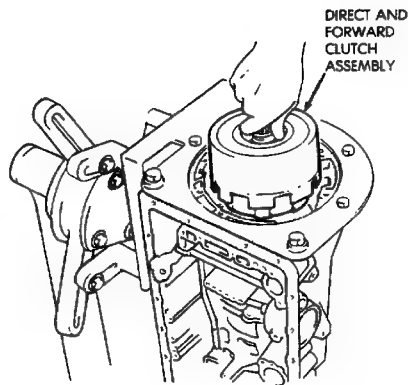
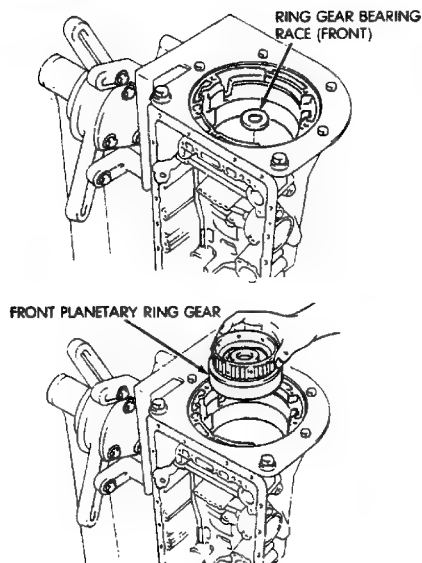
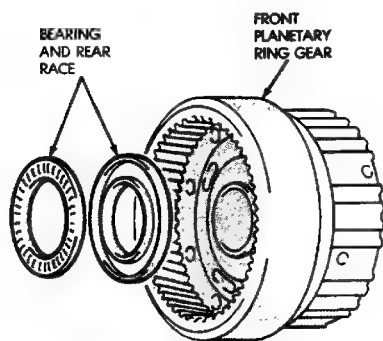


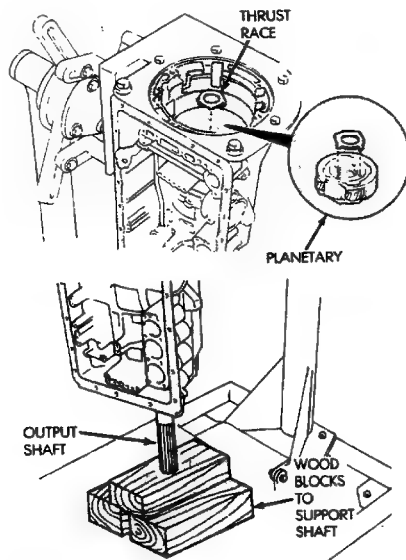
Fig. 31 Removing Direct And Forward Clutch Assembly



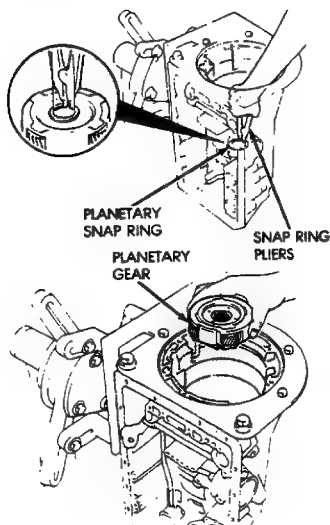
**Fig. 34 Removing Front Planetary Ring Gear**



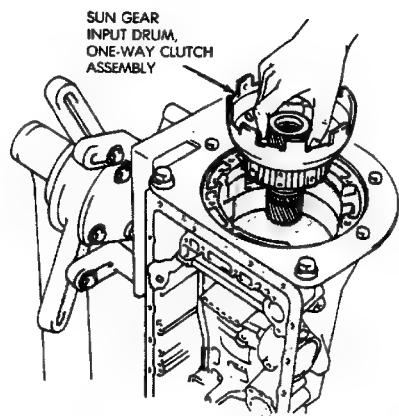
**Fig. 35 Removing Ring Gear Bearing And Rear Race**



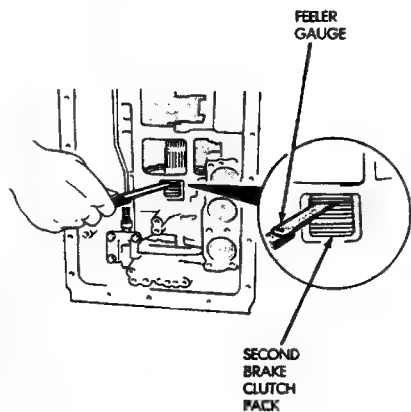
**Fig. 36 Relieving Load On Planetary Snap Ring**



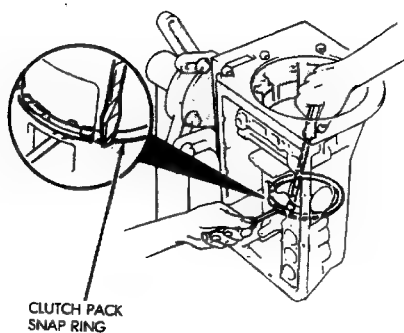
**Fig. 37 Removing Planetary Snap Ring And Gear**



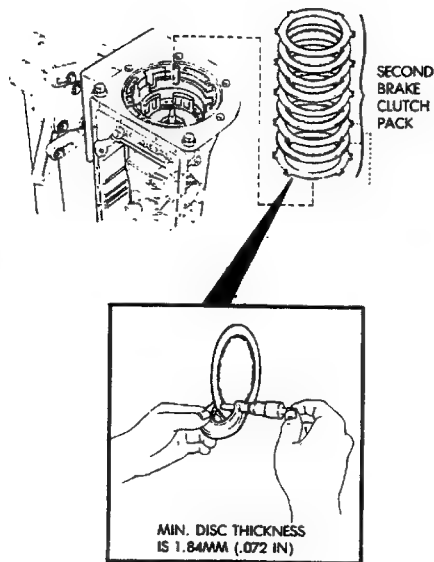
**Fig. 38 Removing Sun Gear, Input Drum And One-Way Clutch**



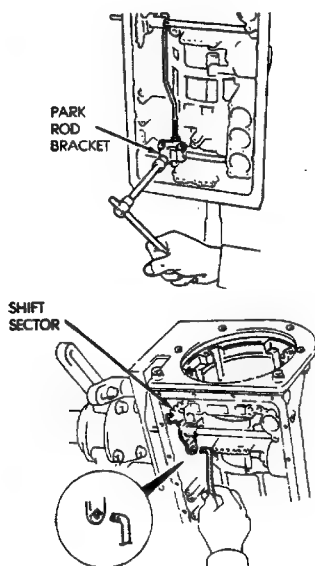
**Fig. 39 Checking Second Brake Clutch Pack Clearance**



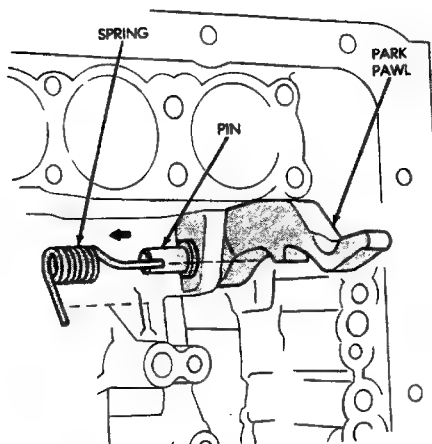
**Fig. 40 Removing Second Brake Clutch Pack Snap Ring**



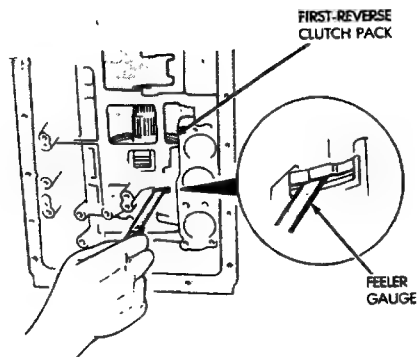
**Fig. 41 Remove/Measure Second Brake Clutch Disc Thickness**



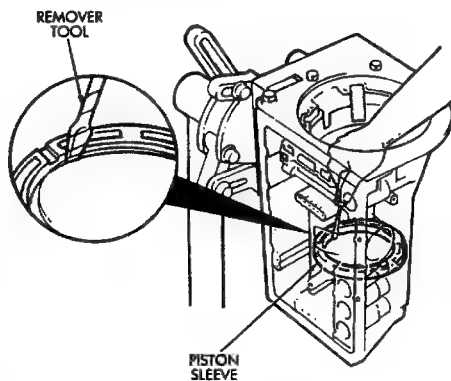
**Fig. 42 Removing Park Rod And Bracket**



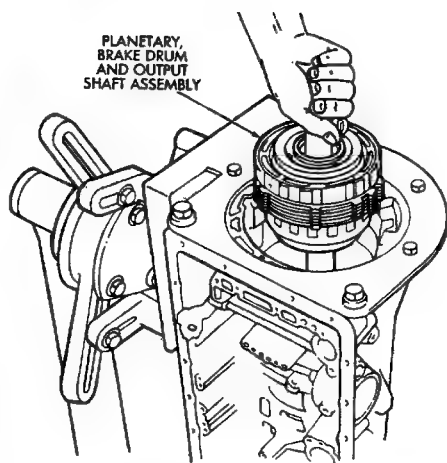
**Fig. 43 Removing Park Pawl, Pin And Spring**



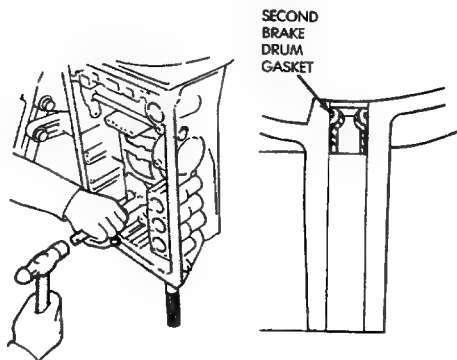
**Fig. 44 Checking First-Reverse Brake Clutch Pack Clearance**



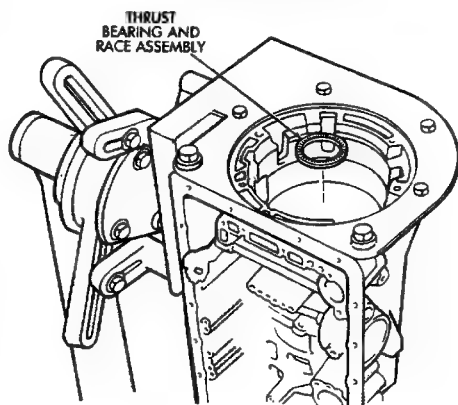
**Fig. 45 Removing Second Brake Piston Sleeve**



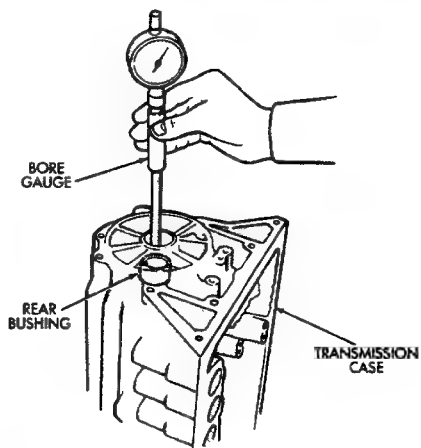
**Fig. 46 Removing Rear Planetary, Second Brake Drum And Output Shaft**



**Fig. 48 Removing Brake Drum Gasket**



**Fig. 47 Removing Planetary And Brake Drum Thrust Bearing And Race Assembly**



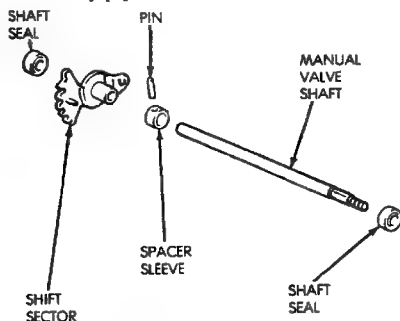
**Fig. 49 Checking Rear Bushing Inside Diameter**



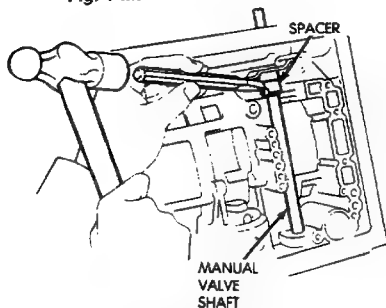
## SUBASSEMBLY OVERHAUL AND TRANSMISSION ASSEMBLY

### MANUAL VALVE SHAFT OVERHAUL

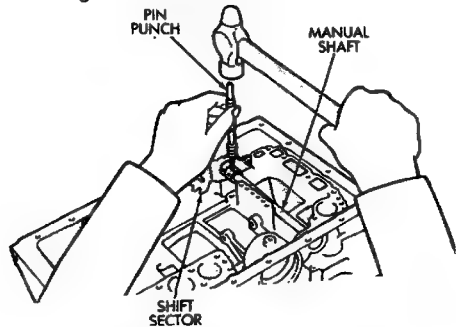
- (1) Remove shaft spacer sleeve in half with chisel and remove it from lever and shaft (Fig. 2).
- (2) Remove shift sector retaining pin with pin punch (Fig. 3).
- (3) Pull shaft out of case and remove manual lever.
- (4) Carefully pry shaft seals from case.



**Fig. 1 Manual Valve Shaft Components**

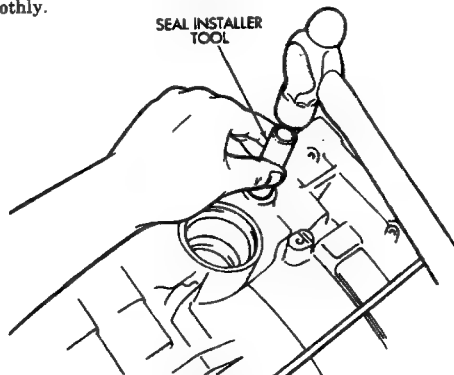


**Fig. 2 Cutting Shaft Spacer Sleeve**

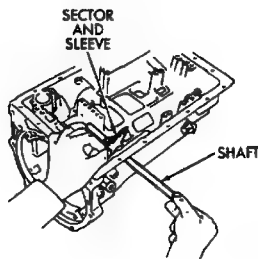
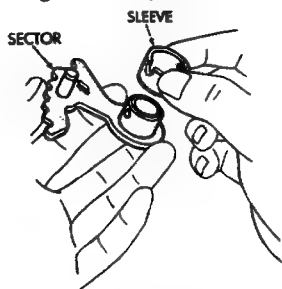


**Fig. 3 Removing/Installing Sector Retaining Pin**

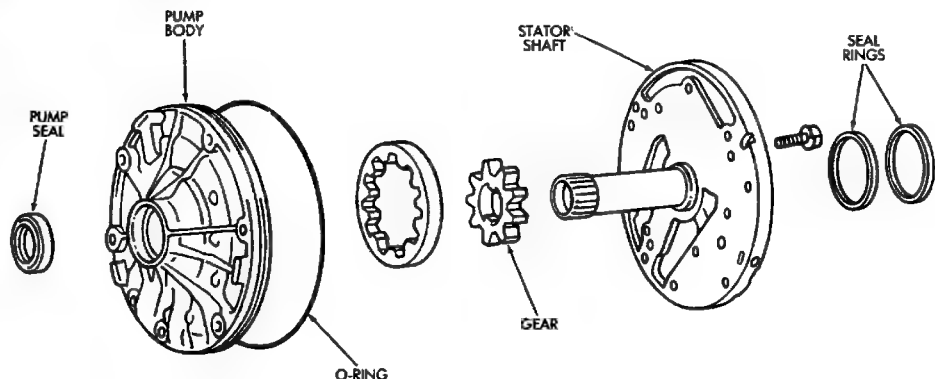
- (5) Lubricate new seals with petroleum jelly and install them in case (Fig. 4).
- (6) Install new spacer sleeve on shift sector (Fig. 5).
- (7) Install sector and sleeve on shaft and install shaft in case.
- (8) Align sector and sleeve and install new retaining pin.
- (9) Align notch in sleeve with depression in sector and stake sleeve in two places. Be sure lever and shaft rotate smoothly.



**Fig. 4 Installing Manual Shaft Seals**



**Fig. 5 Installing Manual Shaft And Sector**

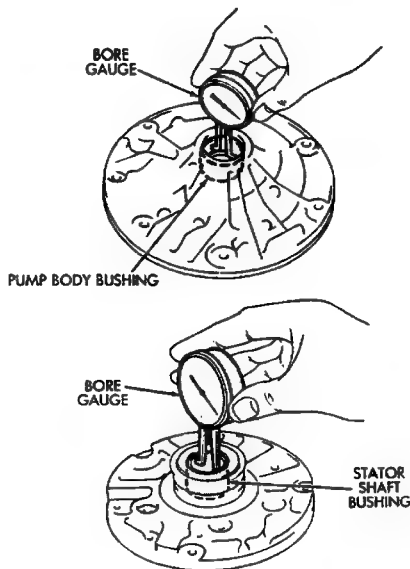


**Fig. 1 Oil Pump Components**

## OIL PUMP OVERHAUL

- (1) Remove pump body O-ring (Fig. 1).
- (2) Remove pump seal rings (Fig. 1).
- (3) Remove bolts attaching stator shaft to pump body and separate components.
- (4) Remove drive gear and driven gear from pump body (Fig. 1).
- (5) Measure inside diameter of pump body bushing with bore gauge (Fig. 2). Diameter should be maximum of 38.19 mm (1.5035 in). Replace pump body if bushing I.D. is greater than specified.
- (6) Measure inside diameter of stator shaft bushing (Fig. 2). Take measurements at front and rear of bushing. Diameter should be maximum of 21.58 mm (.8496 in) at front and 27.08 mm (1.0661 in) at rear. Replace stator shaft if bushing diameter is greater than specified.
- (7) Measure oil pump clearances (Fig. 3).
  - Clearance between pump driven gear and pump body should be maximum of .3 mm (.012 in).
  - Clearance between tips of pump gear teeth should be maximum of .3 mm (.012 in).
  - Clearance between rear surface of pump housing and pump gears should be maximum of 0.1 mm (.004 in).
- (8) Replace pump body and gears if any clearance is greater than specified.
- (9) Remove old pump seal. Install new seal with installer tool B.Vi. FM. 38 (Fig. 4).
- (10) Lubricate and install gears in pump body.
- (11) Assemble stator shaft and pump body. Tighten shaft-to-body bolts to 10 N·m (7 ft-lbs) torque.
- (12) Install new O-ring on pump body and new seal rings on stator shaft.

- (13) Install pump in torque converter and check pump gear rotation. Gears must rotate smoothly when turned clockwise and counterclockwise.
- (14) Lubricate pump O-ring and seal rings with petroleum jelly.



**Fig. 2 Checking Pump/Stator Shaft Bushings**

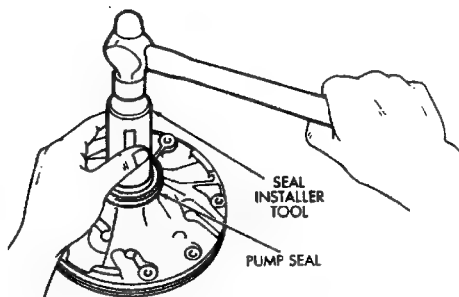
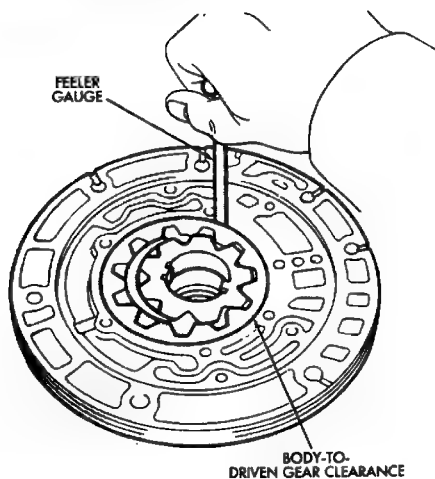


Fig. 4 Installing Pump Seal

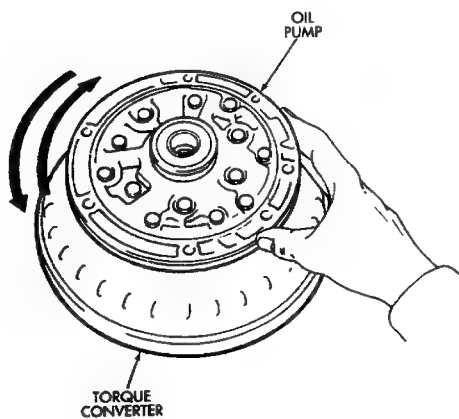
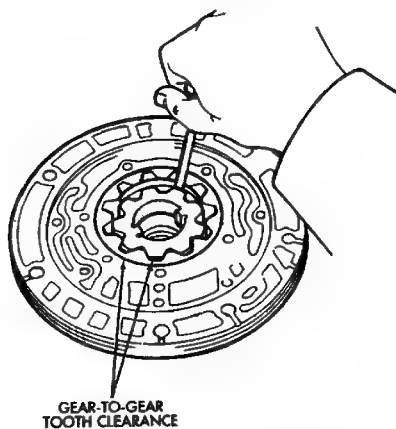


Fig. 5 Checking Pump Gear Rotation

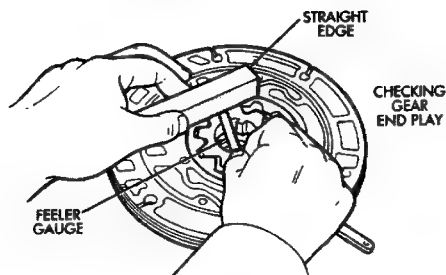


Fig. 3 Checking Pump Gear Clearances

## OVERDRIVE PLANETARY GEAR AND CLUTCH OVERHAUL

### Gear And Clutch Disassembly

(1) Check operation of one-way clutch in clutch drum. Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise. Replace one-way clutch if necessary.

(2) Remove overdrive clutch from planetary gear (Fig. 3).

(3) Remove thrust bearing and race assembly from clutch drum (Fig. 4).

(4) Measure stroke length of clutch piston as follows:

(a) Mount oil pump on torque converter. Then mount clutch on oil pump (Fig. 5).

(b) Mount dial indicator on clutch and position indicator stylus on clutch piston (Fig. 6).

(c) Apply compressed air through clutch feed hole in oil pump and note piston stroke length. Stroke length should be 1.85 to 2.15 mm (.0728 to .0846 in).

(5) Replace clutch pack retainer if stroke length is incorrect. Refer to chart in Specifications section for replacement retainer thicknesses.

(6) Remove clutch pack snap ring and remove the clutch pack.

(7) Compress piston return spring with tool B.Vi. FM. 27 and shop press and remove piston snap ring (Fig. 8).

(8) Remove compressor tool and piston return springs.

(9) Mount oil pump on converter. Then mount clutch on oil pump (Fig. 9).

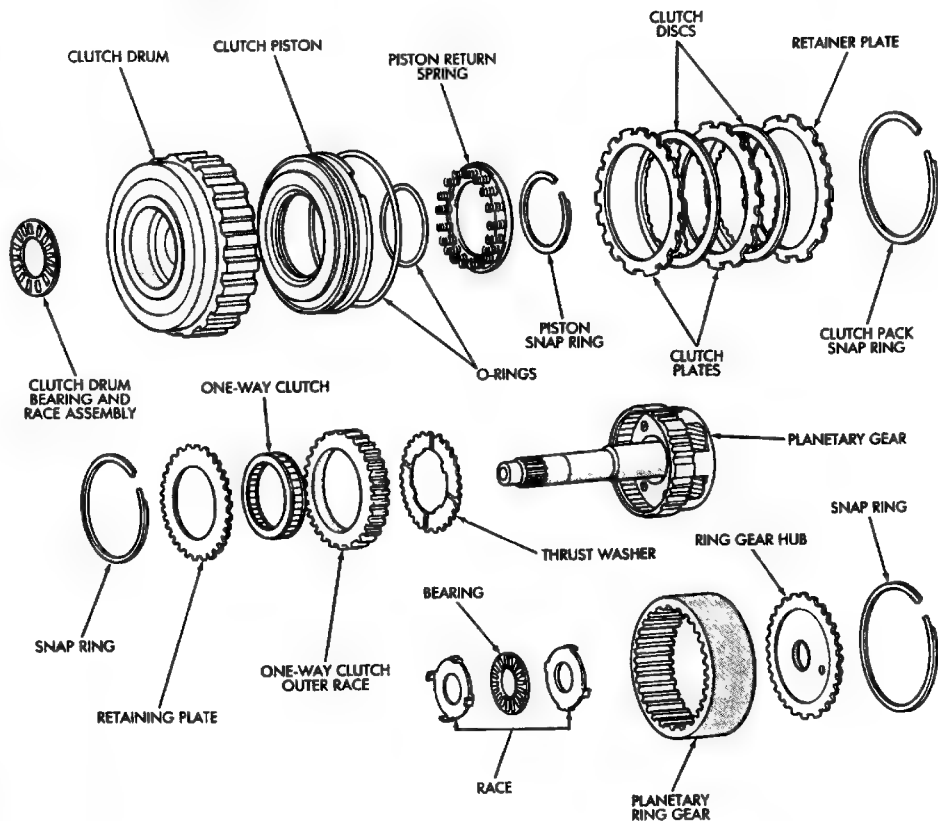


Fig. 1 Overdrive Planetary Gear And Clutch Components

(10) Hold clutch piston by hand and apply compressed air through oil pump feed hole to ease piston out (Fig. 9). Apply only enough air pressure to remove piston.

(11) Remove bearing and race from ring gear (Fig. 10).

(12) Remove snap ring from ring gear and remove ring gear hub (Fig. 11).

(13) Remove race from planetary gear (Fig. 12).

(14) Remove snap ring and remove retaining plate (Fig. 13).

(15) Remove one-way clutch and outer race as assembly. Then separate race from clutch (Fig. 14).

(16) Remove thrust washer (Fig. 15).

(17) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (.0724 in).

(18) Measure free length of piston return springs with springs in retainer (Fig. 16). Length should be 16.8 mm (.661 in).

(19) Check clutch piston check ball (Fig. 17). Shake piston to see if ball moves freely. Then check ball sealing by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

(20) Check inside diameter of clutch drum bushings with bore gauge (Fig. 18). Maximum inside diameter is 27.11 mm (1.0673 in). Replace drum if bushing inside diameter is greater than specified.

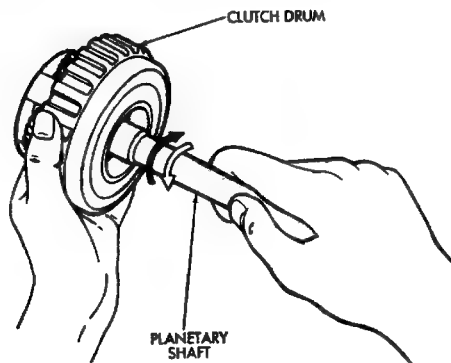


Fig. 2 Checking One-Way Clutch

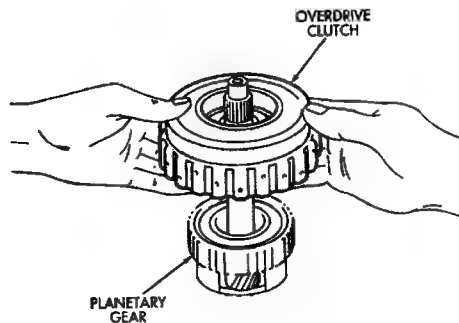


Fig. 3 Removing Overdrive Clutch From Gear

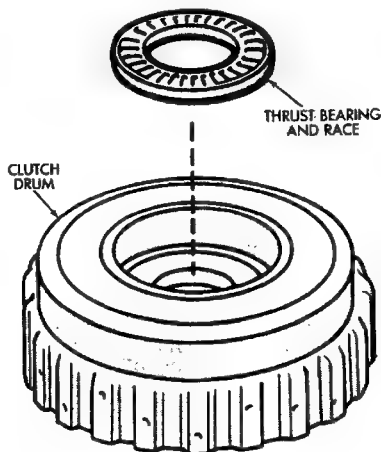


Fig. 4 Removing Clutch Drum Bearing And Race

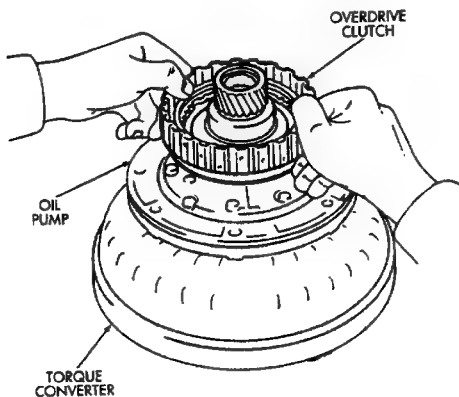


Fig. 5 Assembling Converter, Pump And Clutch For Test

(21) Check inside diameter of planetary gear bushing (Fig. 19). Maximum inside diameter is 11.27 mm (0.4437 in). Replace planetary gear if bushing inside diameter is greater than specified.

## Gear And Clutch Assembly

(1) Install thrust washer in planetary gear (Fig. 20). Grooved side of washer faces up and toward front.

(2) Install one-way clutch in race (Fig. 21). Flanged side of clutch must face upward as shown.

(3) Install assembled one-way clutch and outer race in planetary gear. Be sure flanged side of clutch is facing upward.

(4) Install clutch pack retaining plate and snap ring in planetary gear.

(5) Coat planetary race with petroleum jelly and install it on planetary gear. Outside diameter of race is 41.8 mm (1.646 in); inside diameter is 27.1 mm (1.067 in).

(6) Install hub in planetary ring gear and install snap ring.

(7) Coat race and bearing with petroleum jelly and install in planetary ring gear (Fig. 22).

(8) Verify bearing/race size. Outside diameter of race is 47.8 mm (1.882 in); inside diameter is 24.2 mm (.953 in). Outside diameter of bearing is 46.8 mm (1.843 in); inside diameter is 26 mm (1.024 in).

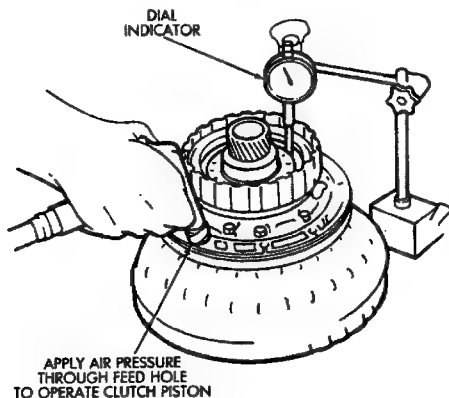


Fig. 6 Checking Overdrive Clutch Piston Stroke

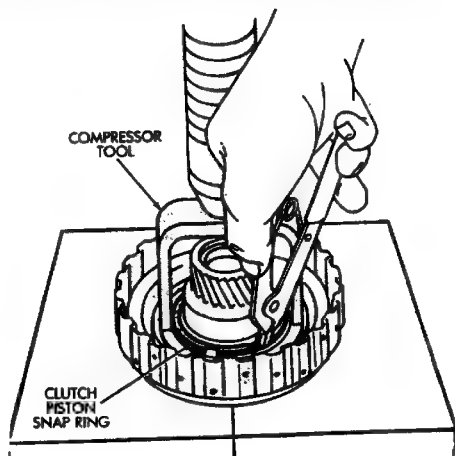


Fig. 8 Removing Clutch Piston Snap Ring

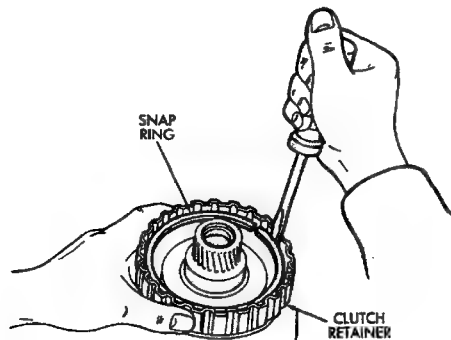


Fig. 7 Removing Clutch Pack Snap Ring

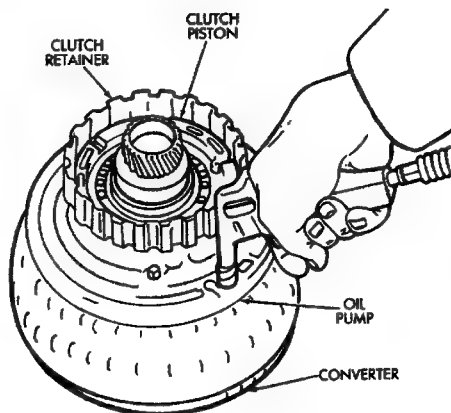
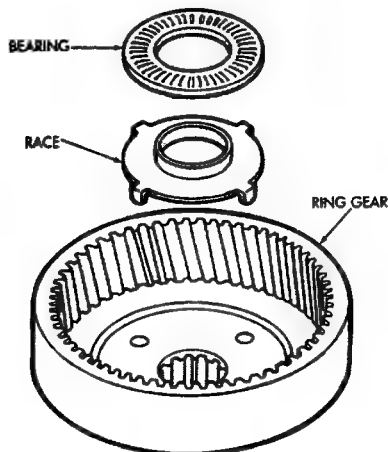


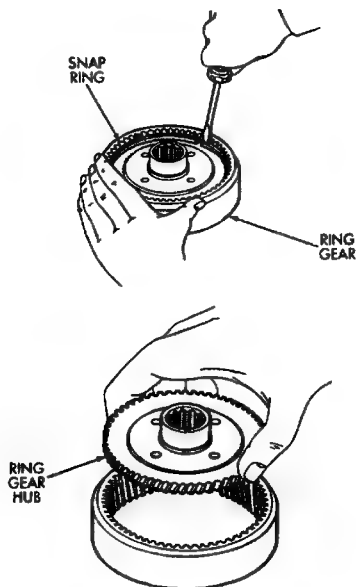
Fig. 9 Removing Overdrive Clutch Piston

(9) Lubricate and install new O-rings on clutch piston. Then install piston in clutch drum.

(10) Install piston return springs in clutch piston (Fig. 23).



**Fig. 10 Removing Ring Gear Bearing And Race**



**Fig. 11 Removing Ring Gear Hub**

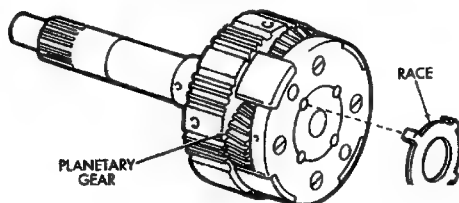
(11) Install piston snap ring. Compress piston return springs with compressor tool and shop press (Fig. 24).

(12) Install clutch pack in drum. Install steel plate first, then a disc (Fig. 25). Continue installation sequence until required number of discs and plates have been installed.

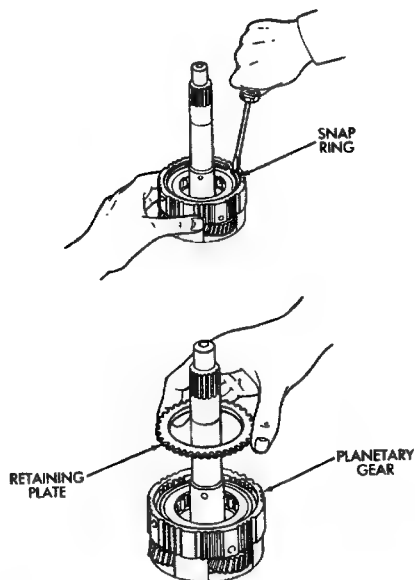
(13) Install clutch pack retainer with flat side facing downward. Then install retainer snap ring (Fig. 26). Compress springs with tool B.Vi. FM. 27.

(14) Measure clutch piston stroke length again (refer to procedure outlined in disassembly procedure ). If stroke length is incorrect, install new clutch discs or select fit retainer. Retainer thicknesses are outlined in the Specifications section.

(15) Install clutch drum bearing and race assembly (Fig. 27). Be sure bearing rollers face upward as shown.



**Fig. 12 Remove Planetary Gear Race**

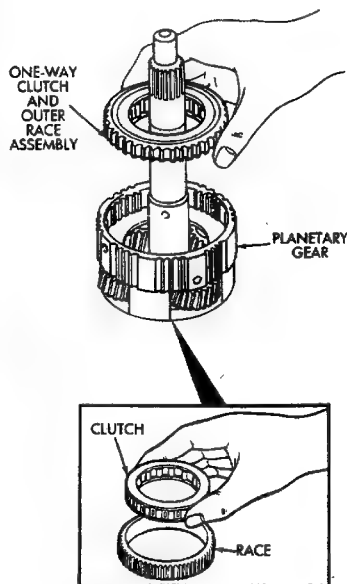


**Fig. 13 Removing Snap Ring And Retaining Plate**

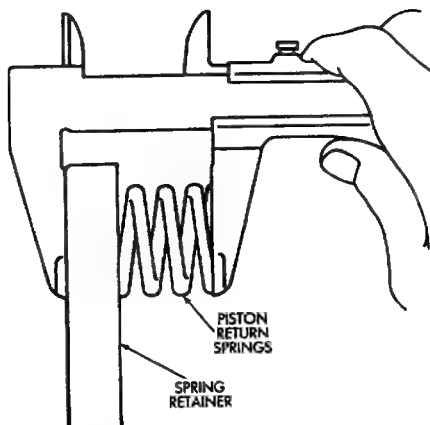
Outside diameter of assembled bearing and race is 50.2 mm (1.976 in). Inside diameter is 28.9 mm (1.138 in).

(16) Install clutch on planetary gear.

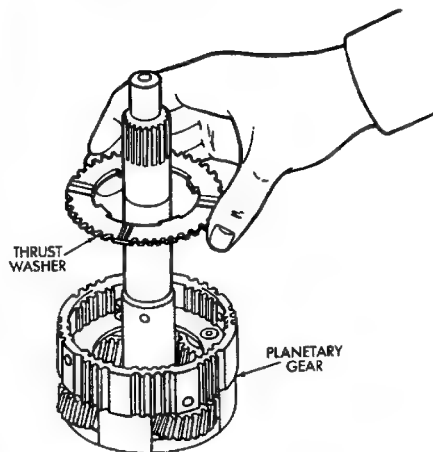
(17) Verify one-way clutch operation. Hold drum and turn planetary shaft clockwise and counterclockwise. Shaft should turn clockwise freely but lock when turned counterclockwise.



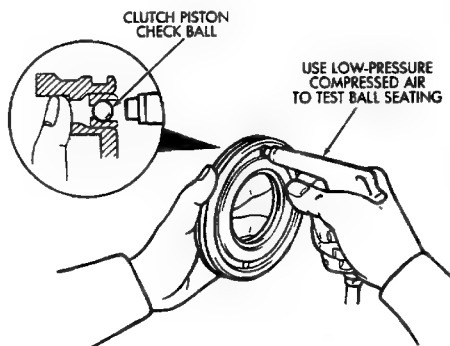
**Fig. 14 Removing One-Way Clutch**



**Fig. 16 Checking Piston Return Spring Length**

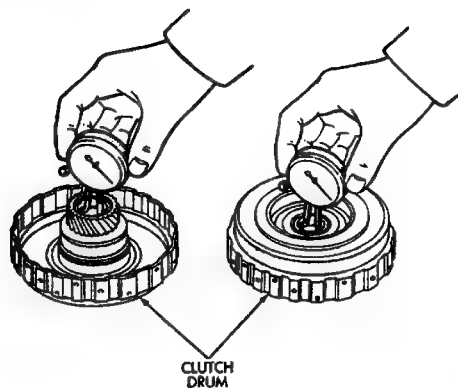


**Fig. 15 Removing Planetary Thrust Washer**

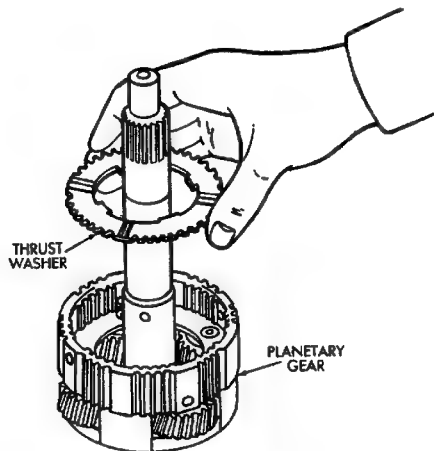


**Fig. 17 Testing Clutch Piston Check Ball**

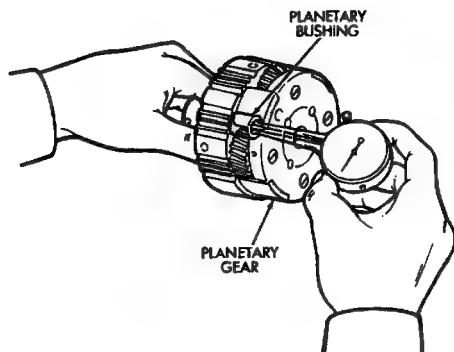




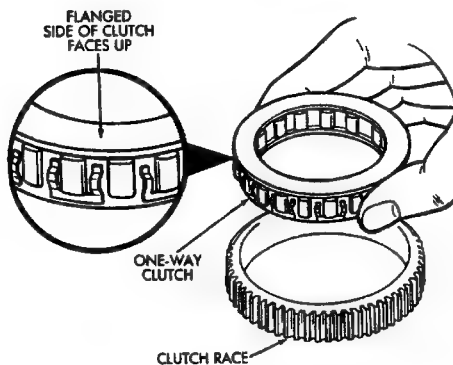
**Fig. 18 Checking Clutch Drum Bushings**



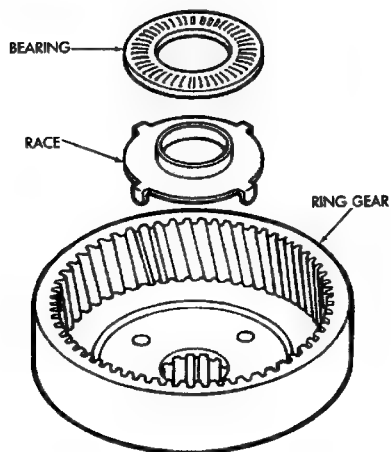
**Fig. 20 Install Planetary Thrust Washer**



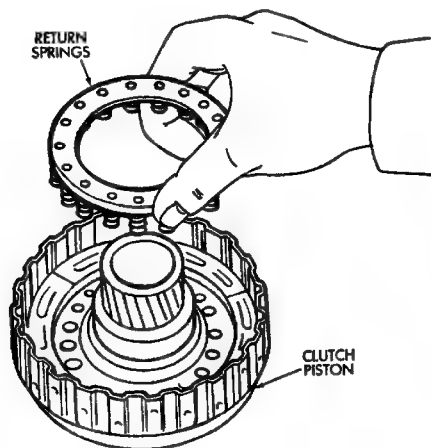
**Fig. 19 Checking Planetary Bushing**



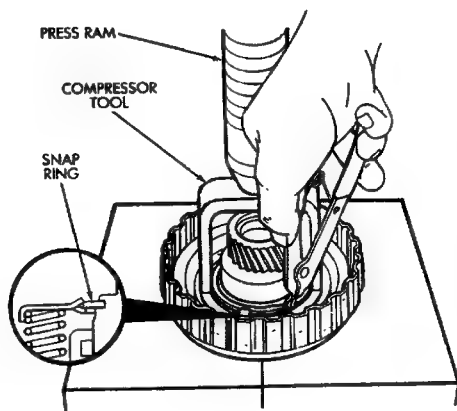
**Fig. 21 Assembling One-Way Clutch And Race**



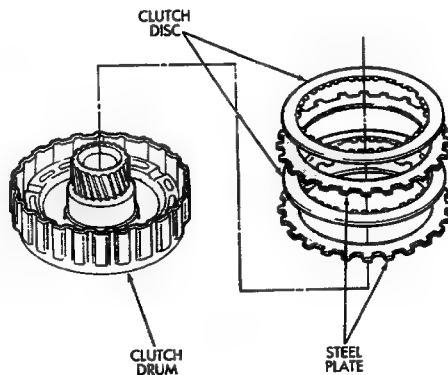
**Fig. 22 Install Ring Gear Bearing And Race**



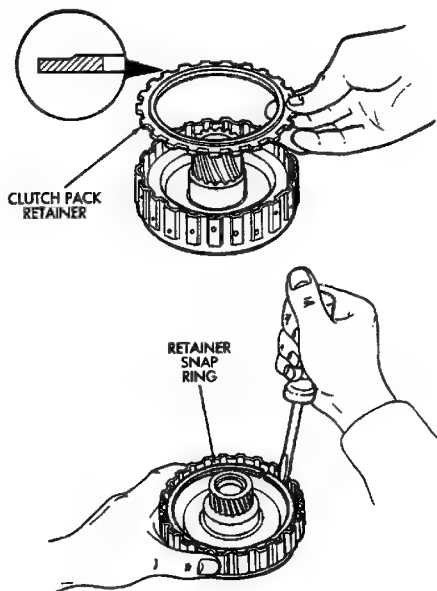
**Fig. 23 Installing Piston Return Springs**



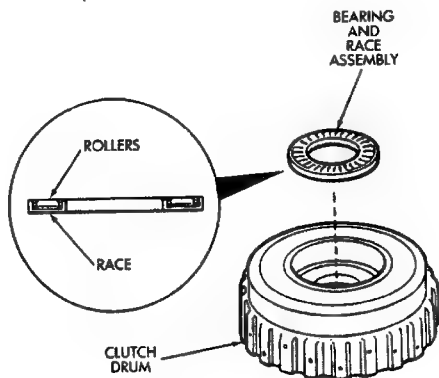
**Fig. 24 Installing Clutch Piston Snap Ring**



**Fig. 25 Installing Clutch Discs And Plates**



**Fig. 26 Installing Retainer And Snap Ring**



**Fig. 27 Installing Clutch Drum Bearing And Race Assembly**

## OVERDRIVE SUPPORT OVERHAUL

### Support Disassembly

(1) Check brake piston operation. Mount support on clutch (Fig. 2).

(2) Apply compressed air through support feed hole and observe brake piston movement (Fig. 2). Piston should move smoothly and not bind or stick. If operation is incorrect, replace piston and support.

(3) Remove thrust bearing front race, thrust bearing and rear race (Fig. 3).

(4) Turn overdrive support over and remove bearing race and clutch drum thrust washer (Fig. 4).

(5) Compress piston return spring with tool B.Vi. FM. 26 and remove piston snap ring (Fig. 5).

(6) Mount support in direct clutch and remove brake piston with compressed air. Apply air to same feed hole used when checking piston operation.

(7) Remove and discard support O-rings (Fig. 1).

(8) Remove support seal rings (Fig. 6).

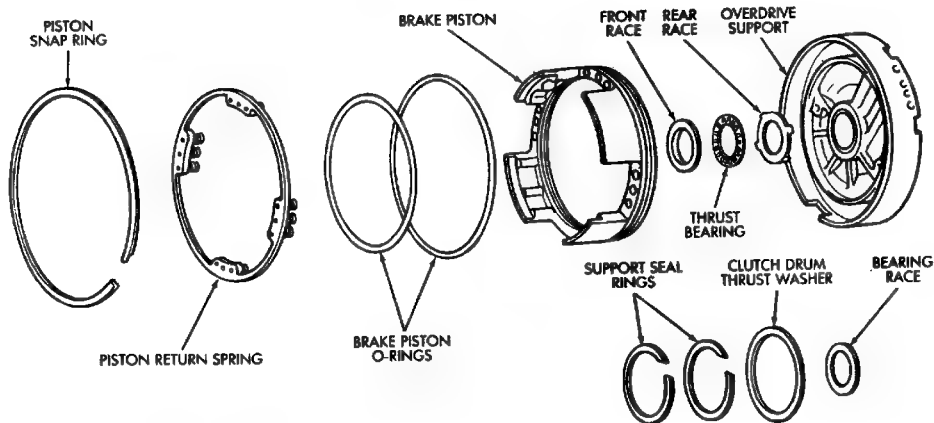


Fig. 1 Overdrive Support Components

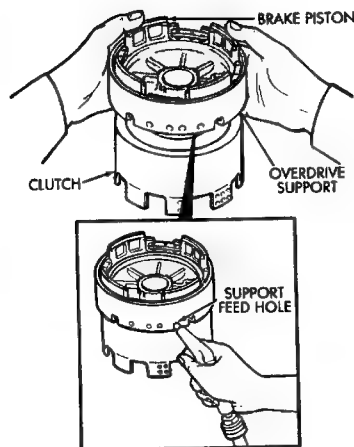


Fig. 2 Checking Brake Piston Movement

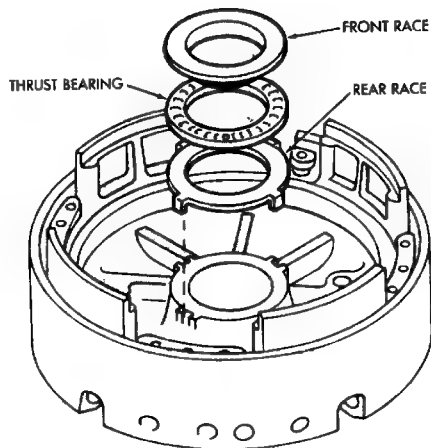
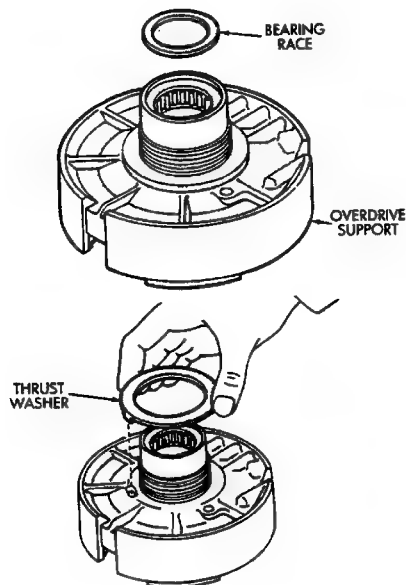


Fig. 3 Removing Support Thrust Bearing And Races

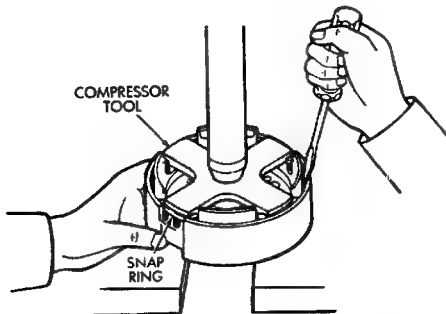
(9) Measure free length of piston return springs with springs mounted in retainer (Fig. 7). Length should be 18.61 mm (.733 in).

(10) Clean support components and dry them with compressed air.

(11) Inspect overdrive support and brake piston. Replace support and piston if either part is worn or damaged.



**Fig. 4 Removing Clutch Drum Thrust Washer And Race**



**Fig. 5 Removing/Installing Piston Snap Ring**

### **Assembling Overdrive Support**

(1) Lubricate new support seal rings. Then compress rings and install them on support (Fig. 8).

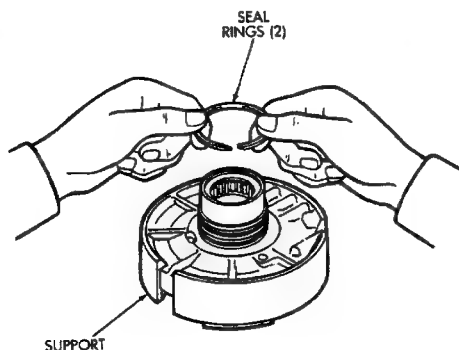
(2) Lubricate and install new O-rings on brake piston. Then carefully seat piston in support.

(3) Install return springs on brake piston.

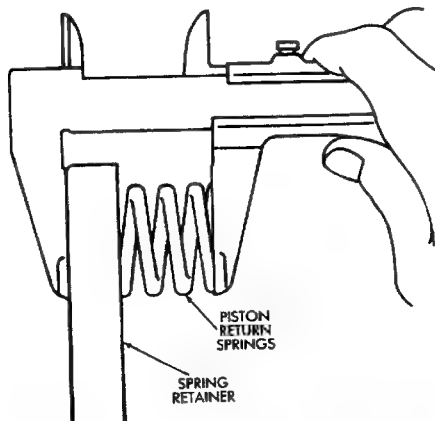
(4) Compress return springs with tool (Fig. 5) and install piston snap ring.

(5) Install support bearing race and clutch drum thrust washer (Fig. 4).

(6) Install thrust bearing and front and rear bearing races. Thrust bearing rollers should face upward as shown (Fig. 9).



**Fig. 6 Removing Support Seal Rings**

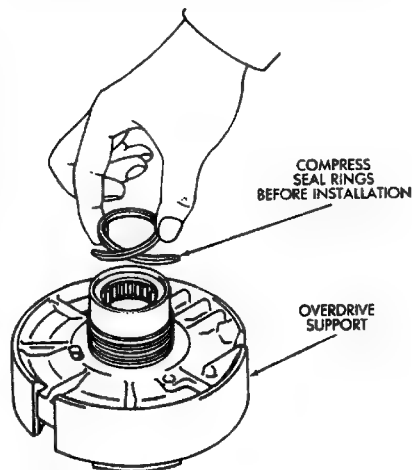


**Fig. 7 Checking Piston Return Spring Length**

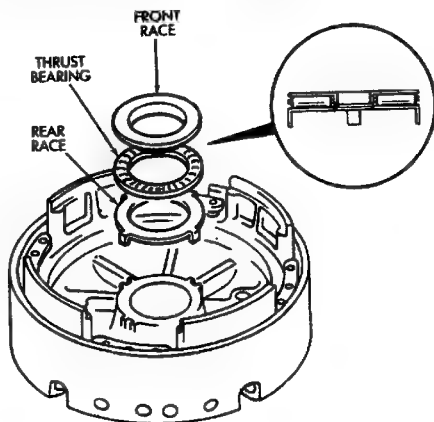
(7) Verify thrust bearing/race sizes (Fig. 9). Front race outer diameter is 47.8 mm (1.882 in); inside diameter is 30.7 mm (1.209 in). Rear race outer diameter is 47.8 mm

(1.882 in); inside diameter is 34.3 mm (1.350 in). Bearing outer diameter is 47.7 mm (1.878 in); inside diameter is 32.7 mm (1.287 in).

(8) Verify brake piston operation. Use same procedure described at beginning of disassembly. Piston should operate smoothly and not bind or stick.



**Fig. 8 Installing Support Seal Rings**



**Fig. 9 Installing Support Thrust Bearing And Races**

## DIRECT CLUTCH OVERHAUL

### Clutch Disassembly

- (1) Remove direct clutch from forward clutch (Fig. 2).
- (2) Remove clutch drum thrust washer (Fig. 3).

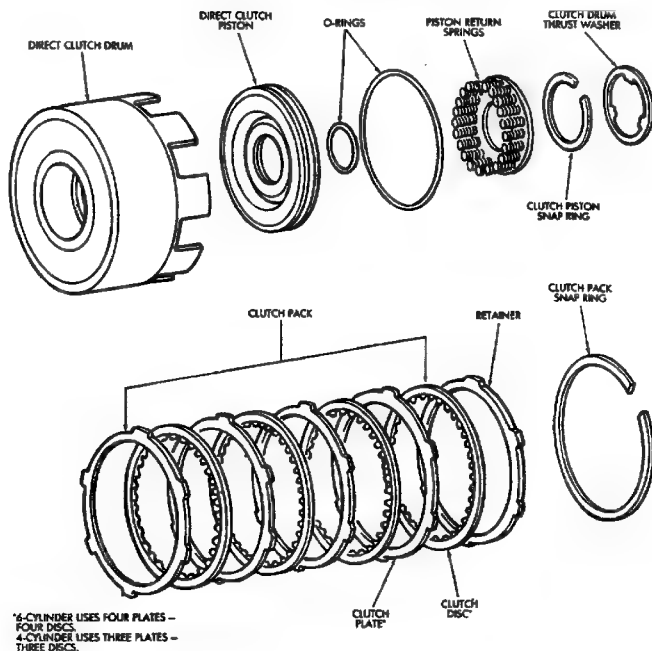


Fig. 1 Direct Clutch Components

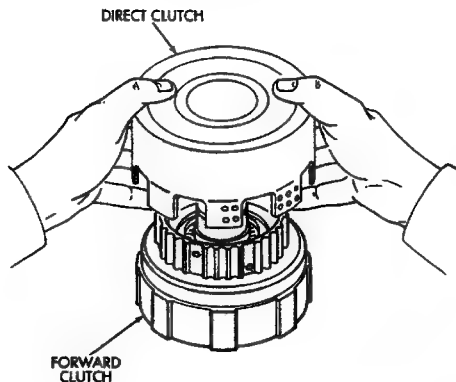


Fig. 2 Separate Direct Clutch From Forward Clutch 55

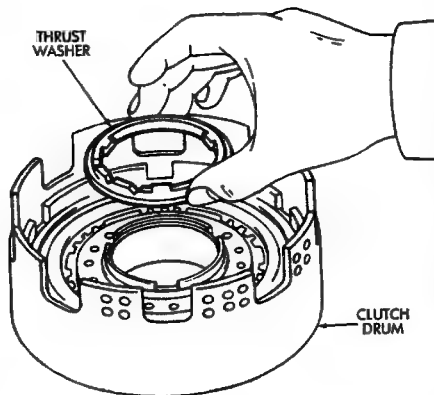


Fig. 3 Removing Clutch Drum Thrust Washer

(3) Check clutch piston stroke length as outlined in following steps.

(4) Mount direct clutch on overdrive support assembly (Fig. 4).

(5) Mount dial indicator on clutch and position indicator plunger on clutch piston (Fig. 4).

(6) Apply 57-114 psi air pressure through feed hole in overdrive support and note piston stroke length (Fig. 5). Check stroke at least twice.

(7) Piston stroke length should be 1.37 mm to 1.60 mm (.0539 to .0642 in). If stroke length is incorrect, either the clutch pack retainer or clutch discs will have to be replaced.

(8) Compress clutch springs with tool B.Vi. FM. 27. Remove clutch pack snap ring and remove retainer and clutch pack from drum (Fig. 6).

(9) Compress clutch piston return springs with tool B.Vi. FM. 27 and remove clutch piston snap ring (Fig. 7).

(10) Remove compressor tool and return spring.

(11) Remove clutch piston. Remount clutch on overdrive support (Fig. 8). Apply compressed air through piston feed hole in support to remove piston. Use only enough air to ease piston out.

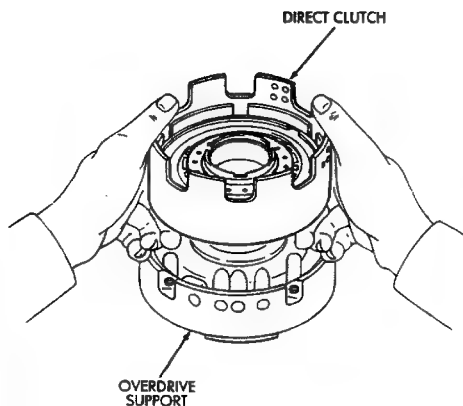


Fig. 4 Mount Direct Clutch On Overdrive Support

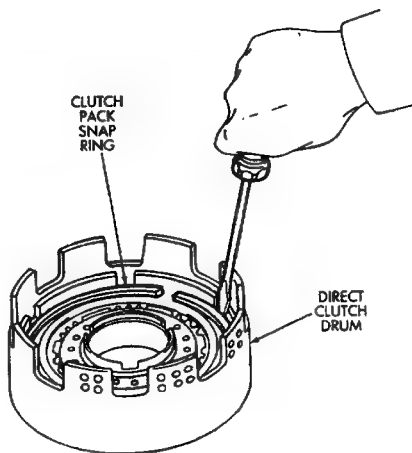


Fig. 6 Removing Clutch Pack Snap Ring

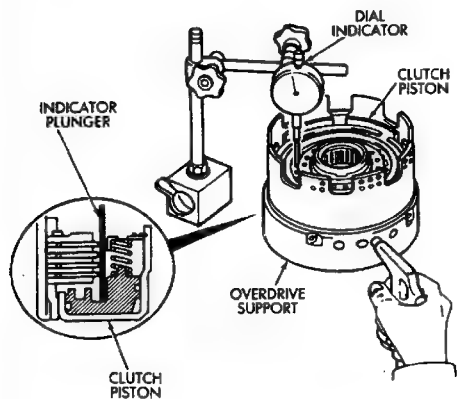


Fig. 5 Checking Direct Clutch Piston Stroke Length

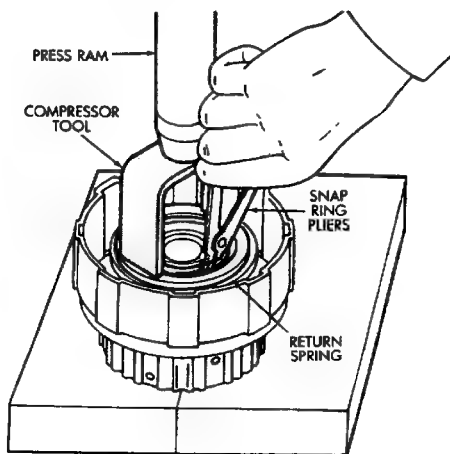


Fig. 7 Removing Piston Return Spring Snap Ring



- (12) Remove and discard clutch piston O-rings.
- (13) Measure clutch disc thickness. Minimum allowable thickness is 1.84 mm (.0724 in). Replace discs if below minimum thickness.
- (14) Measure free length of piston return springs with springs in retainer (Fig. 9). Length should be 21.32 mm (.839 in). Replace return springs if not within specification.
- (15) Check clutch piston check ball (Fig. 10). Shake piston to see if ball moves freely. Then check ball seating by applying low pressure compressed air to ball inlet as shown. Air should not leak past check ball.

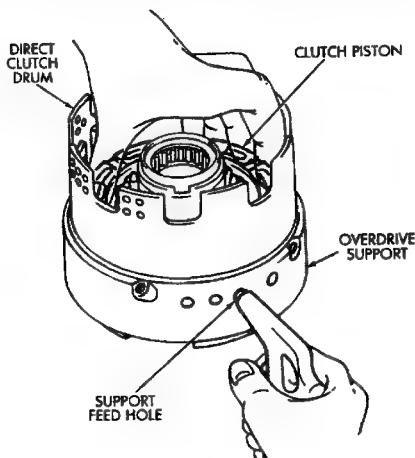


Fig. 8 Removing Direct Clutch Piston

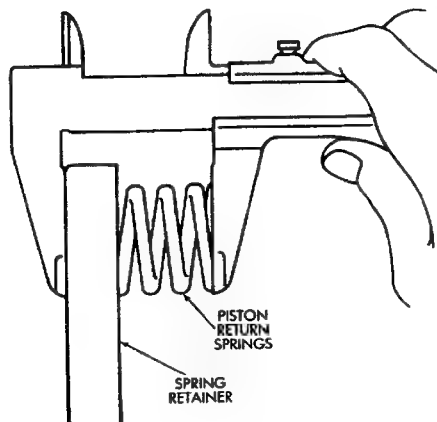


Fig. 9 Checking Piston Return Spring Length

- (16) Measure inside diameter of clutch drum bushing. Inside diameter should be no more than 53.97 mm (2.1248 in). Replace drum if bushing inside diameter is greater than specified.

## Direct Clutch Assembly

- (1) Lubricate and install replacement O-rings on clutch piston.
- (2) Install clutch piston in drum and install return springs on piston.
- (3) Compress piston return springs and install snap ring (Fig. 7). Be sure snap ring end gap is not aligned with spring retainer tab.
- (4) Install clutch discs and plates (Fig. 11). Install plate then disc until all plates and discs are installed. Use four plates and discs in 6-cyl. transmissions and three plates and discs in 4-cyl. transmissions.
- (5) Install clutch pack retainer in drum (Fig. 12).
- (6) Install clutch pack snap ring (Fig. 12).
- (7) Check snap ring position. If necessary, shift snap ring until end gap is not aligned with any notches in clutch drum (Fig. 12).
- (8) Check clutch piston stroke length a second time. If length is OK, continue with assembly. If stroke length is incorrect, replace clutch discs or use different thickness clutch pack retainer (Fig. 12). See Specifications section for retainer thicknesses.
- (9) Lubricate clutch drum thrust washer with petroleum jelly and install it in drum (Fig. 3).
- (10) Mount direct clutch assembly on forward clutch assembly and check assembled height (Fig. 14). Height should be 70.3 to 71.5 mm (2.767 to 2.815 in).
- (11) If assembled height is incorrect, clutches are not seated.

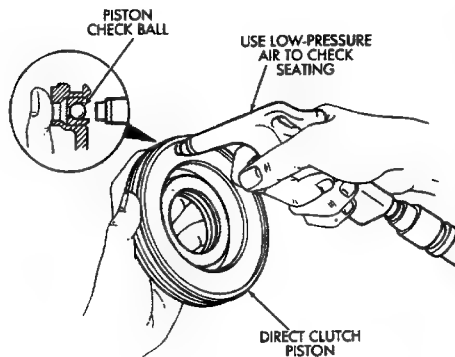
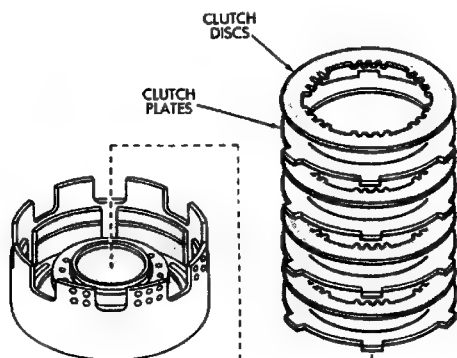
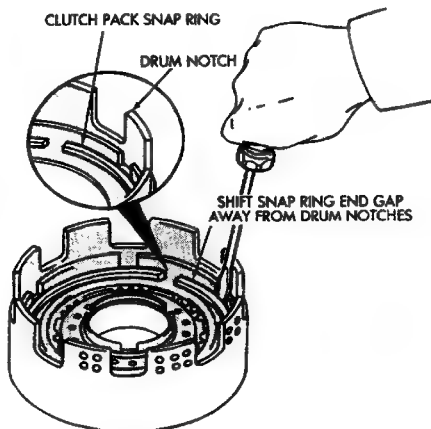


Fig. 10 Testing Piston Check Ball Seating

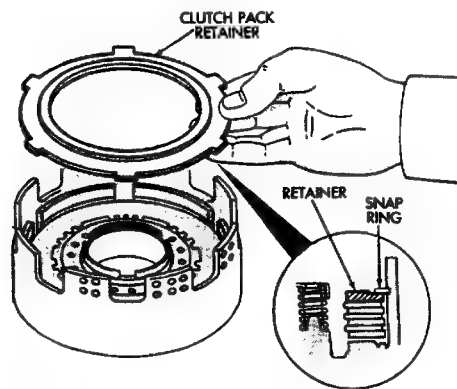
(12) If clutch height is OK, remove direct clutch from forward clutch and proceed to forward clutch overhaul.



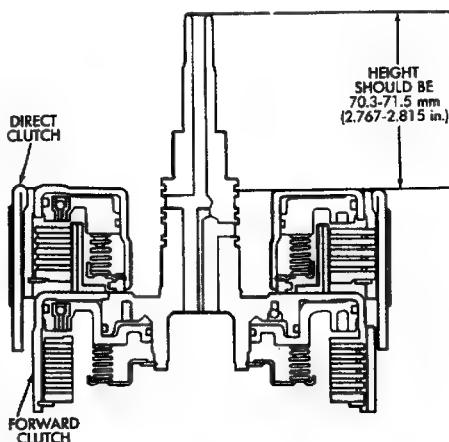
**Fig. 11 Installing Direct Clutch Discs And Plates**



**Fig. 13 Adjusting Clutch Pack Snap Ring Position**

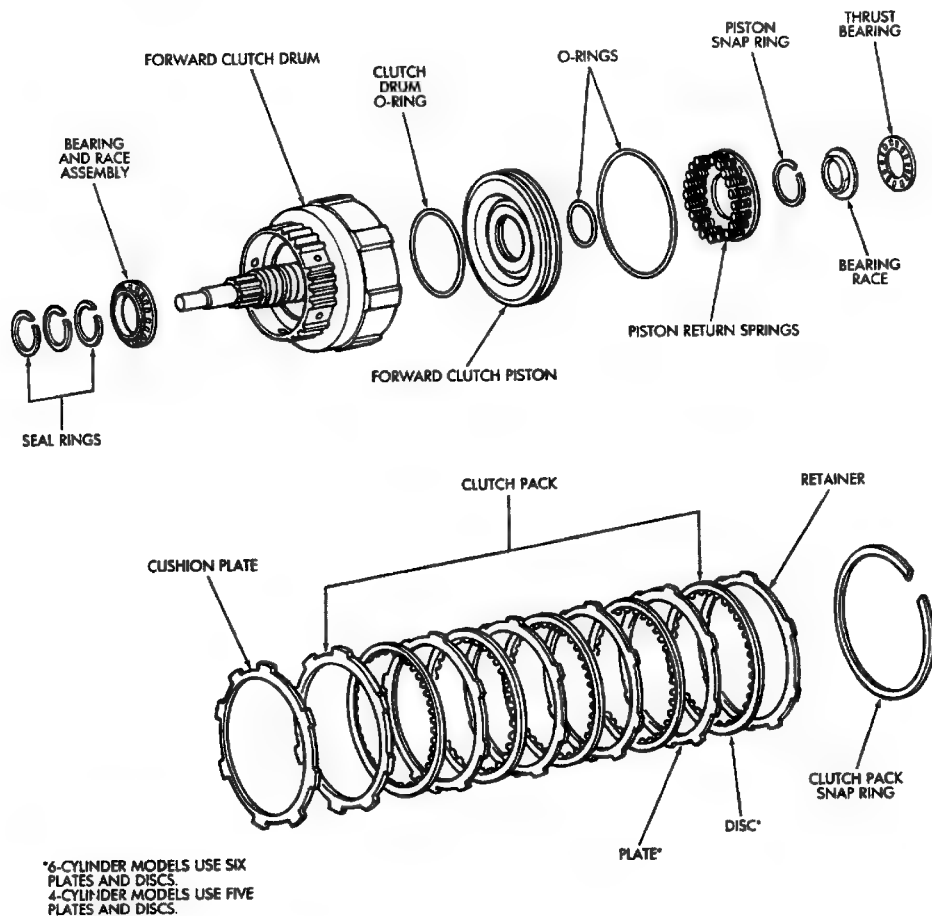


**Fig. 12 Install Clutch Pack Retainer**



**Fig. 14 Checking Direct Clutch Assembled Height**

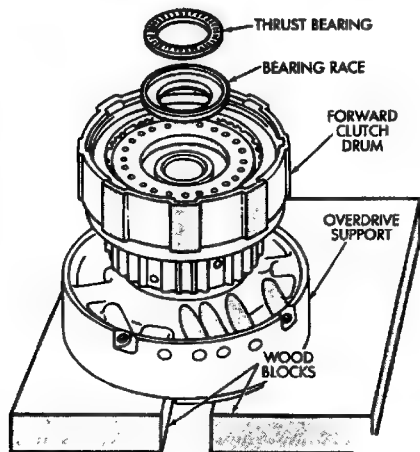
## FORWARD CLUTCH OVERHAUL



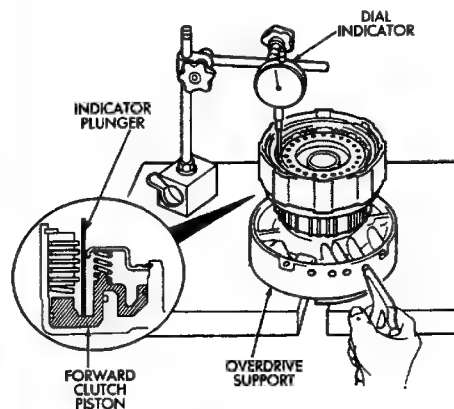
**Fig. 1 Forward Clutch Components**

## Forward Clutch Disassembly

- (1) Check clutch piston stroke as outlined in following steps.
- (2) Position overdrive support on wood blocks and mount forward clutch drum on support (Fig. 2).
- (3) Remove bearing and race from forward clutch drum (Fig. 2).
- (4) Mount dial indicator on clutch drum. Position dial indicator plunger against clutch piston (Fig. 3).

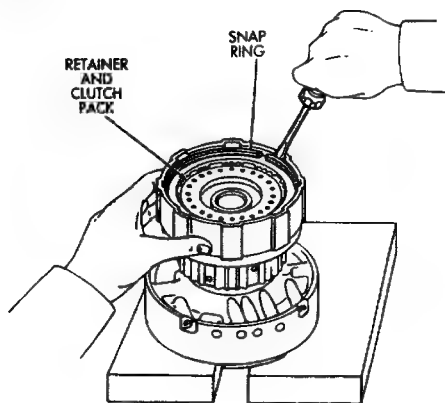


**Fig. 2 Positioning Drum And Support On Wood Blocks**

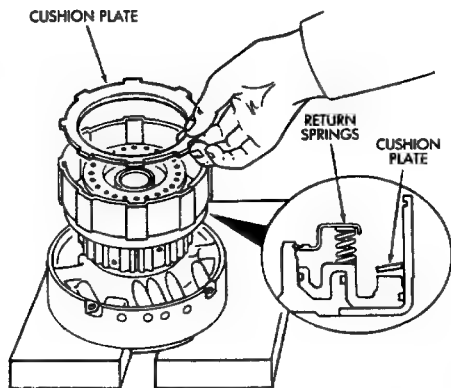


**Fig. 3 Checking Forward Clutch Piston Stroke Length**

- (5) Apply compressed air through right side feed hole in support and note piston stroke length on dial indicator.
- (6) Stroke length should be: 3.73 to 4.59 mm (.1469 to .1807 in) on 6-cyl. transmissions and 3.42 to 4.23 mm (.1346 to .1665 in) on 4-cyl. transmissions.
- (7) Replace clutch discs if stroke length is incorrect.
- (8) Remove clutch pack snap ring and remove retainer and clutch pack (Fig. 4).
- (9) Remove clutch pack cushion plate (Fig. 5).
- (10) Compress clutch springs with tool B.Vi. FM. 27 and remove piston snap ring.
- (11) Remove spring compressor tool and piston return springs.



**Fig. 4 Removing Retainer And Clutch Pack**



**Fig. 5 Removing Cushion Plate**

(12) Remount forward clutch drum on overdrive support (Fig. 6).

(13) Apply compressed air through feed hole in support to remove piston (Fig. 6). Use only enough air pressure to ease piston out of drum.

(14) Remove and discard clutch piston O-rings.

(15) Remove clutch drum O-ring from rear hub (16) of the drum.

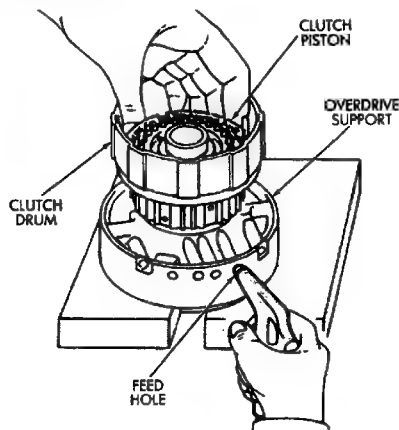
(16) Remove three seal rings from clutch drum shaft (Fig. 8).

(17) Remove thrust bearing and race assembly from clutch drum (Fig. 9).

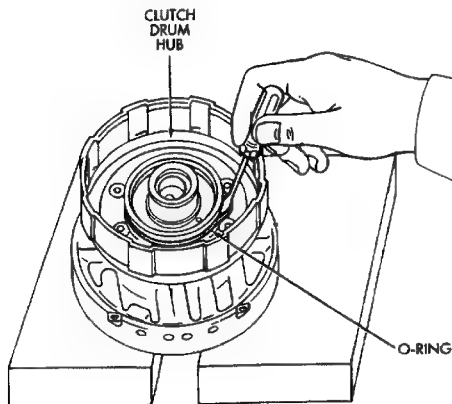
(18) Measure clutch disc thickness (Fig. 10). Minimum allowable thickness is: 1.84 mm (.0724 in) on 4-cyl. transmissions and 1.51 mm (.0595 in) on 6-cyl. transmissions.

(19) Measure free length of piston return springs with springs mounted in retainer (Fig. 11). Length should be 19.47 mm (.767 in). Replace springs and retainer if length is incorrect.

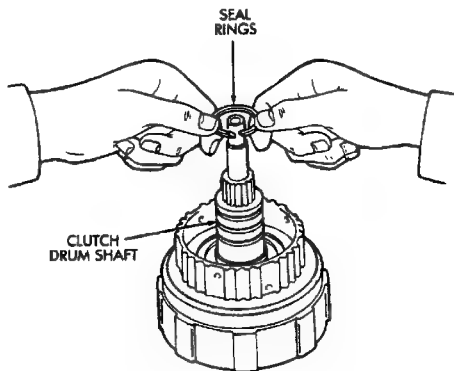
(20) Inspect clutch piston check ball (Fig. 12). Ball should move freely within piston. Check ball seating by



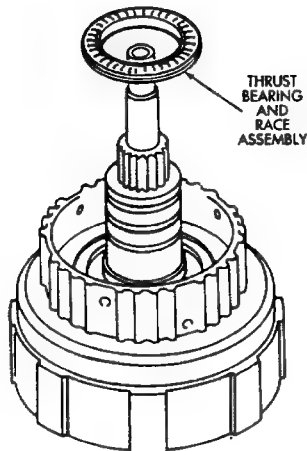
**Fig. 6 Removing Forward Clutch Piston**



**Fig. 7 Removing/Installing Clutch Drum O-Ring**



**Fig. 8 Removing Clutch Drum Seal Rings**



**Fig. 9 Removing Clutch Drum Thrust Bearing Assembly**

applying low pressure compressed air to ball feed hole. Ball should seat firmly and not leak air.

(2) Measure inside diameter of bushing in clutch drum hub. Maximum allowable diameter is 24.08 mm (.9480 in). Replace clutch drum if bushing inside diameter is greater than specified.

## Forward Clutch Assembly

(1) Lubricate bearing and race assembly with petroleum jelly and install it in clutch drum (Fig. 13). Race side of assembly faces downward and toward drum. Bearing rollers face up (Fig. 13)

(2) Coat new clutch drum shaft seal rings with petroleum jelly. Before installing drum shaft seal rings, squeeze (contract) each ring so ring ends overlap (Fig. 14). This tightens ring making clutch installation easier.

(3) Install seal rings on shaft. Keep rings closed as tightly as possible during installation. Avoid over-spreading them.

(4) Mount clutch drum on overdrive support.

(5) Lubricate and install new O-ring on clutch drum hub (Fig. 7).

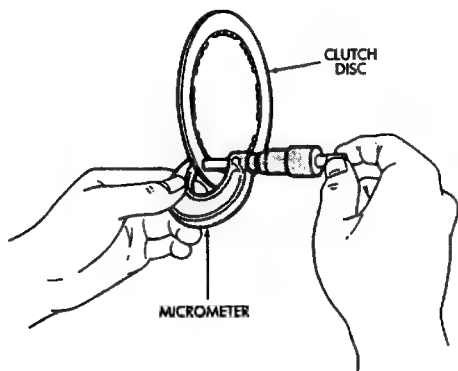


Fig. 10 Measuring Clutch Disc Thickness

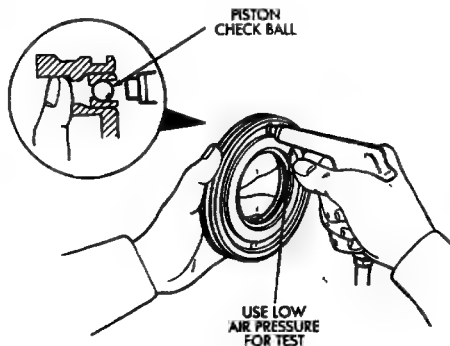


Fig. 12 Testing Piston Check Ball

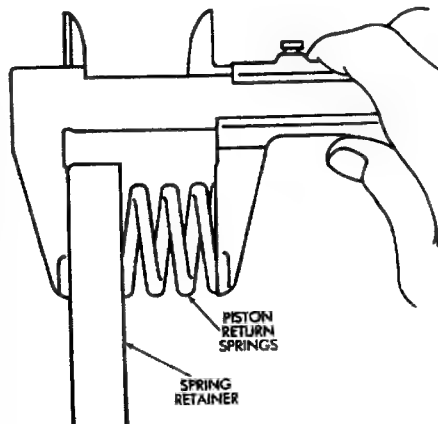


Fig. 11 Checking Return Spring Length

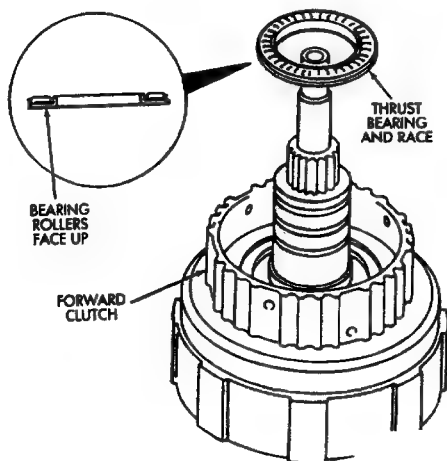


Fig. 13 Installing Thrust Bearing And Race

(6) Lubricate and install new O-rings on clutch piston and install piston in drum.

(7) Install piston return springs.

(8) Compress piston return springs with tool B.Vi. FM-27 and shop press and install piston snap ring. Be sure snap ring end gap is not aligned with any notches in drum.

(9) Install cushion plate in drum. Concave side of plate faces downward (Fig. 5).

(10) Install clutch discs, plates and retainer (Fig. 15). Install tabbed plate followed by disc until required number of plates and discs are installed. Use **six plates and discs in a 6-cyl. transmission** and **five plates and discs in a 4-cyl. transmission**.

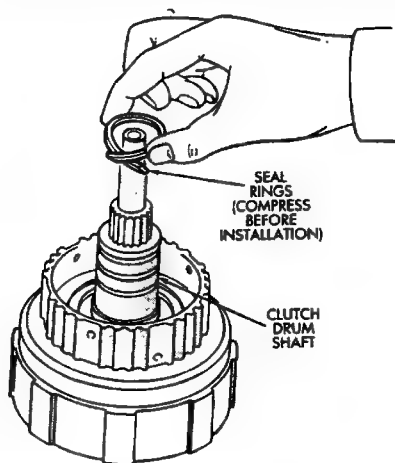
(11) Install clutch pack snap ring.

(12) Recheck clutch piston stroke length using same method outlined at beginning of disassembly procedure. If stroke length is not within specified limits, replace clutch discs.

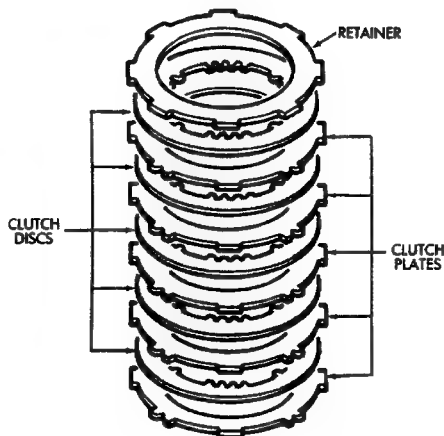
(13) Lubricate race and bearing with petroleum jelly and install them in clutch drum (Fig. 16). Be sure bearing rollers face up and race lip seats in drum as shown.

(14) Verify bearing and race size. Outer diameter of bearing is 46.7 mm (1.839 in). Outer diameter of race is 48.9 mm (1.925 in). Inner diameter of bearing and race is 26.0 mm (1.024 in).

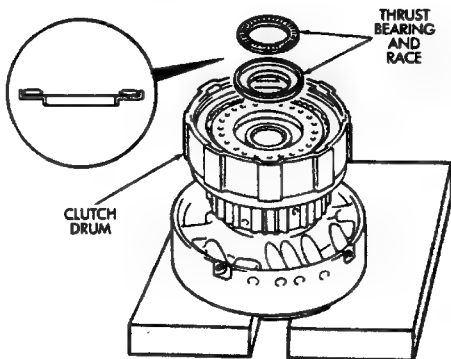
(15) Mount forward clutch on direct clutch and check assembled height (Fig. 17). Height should be 70.3 to 71.5 mm (2.767 to 2.815 in).



**Fig. 14 Installing Clutch Drum Shaft Seal Rings**



**Fig. 15 Installing Forward Clutch Discs And Plates**



**Fig. 16 Installing Thrust Bearing And Race**

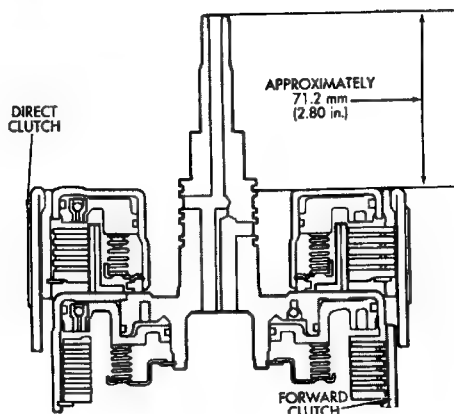


Fig. 17 Checking Forward Clutch Assembled Height

## FRONT PLANETARY GEAR OVERHAUL

### Front Planetary Disassembly

- (1) Remove ring gear from planetary gear (Fig. 1).
- (2) Remove front bearing and the two races from ring gear (Fig. 1).
- (3) Remove tabbed thrust race from planetary gear (Fig. 1).
- (4) Remove snap ring attaching planetary gear to shaft and remove gear.
- (5) Remove rear bearing and race from planetary gear.
- (6) Measure inside diameter of ring gear bushing.

Maximum allowable diameter is 24.08 mm (.9480 in). Replace ring gear if bushing inside diameter is greater than specified.

### Front Planetary Assembly

- (1) Lubricate planetary and ring gear bearings and races with petroleum jelly.
- (2) Identify planetary bearings and races before installation. (Fig. 1). Bearings and races can be identified by following dimensions:
  - Outer diameter of rear bearing is 47.7 mm (1.878 in); inner diameter is 35.5 mm (1.398).

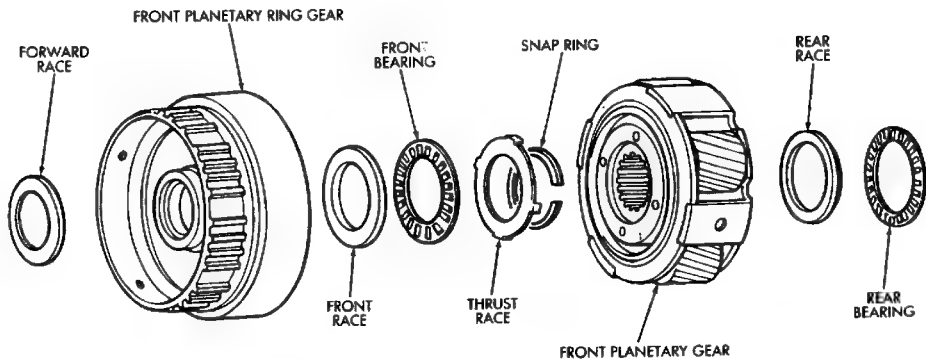


Fig. 1 Front Planetary Gear Components



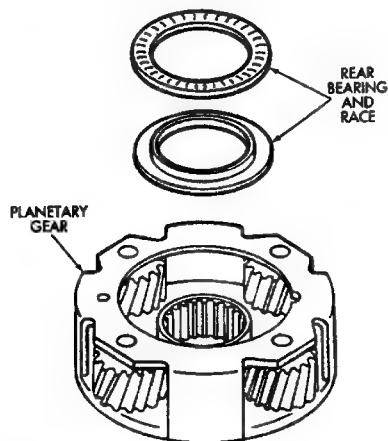
- Outer diameter of rear race 47.6 mm (1.874 in); inner diameter is 33.7 mm (1.327 in).
- Outer diameter of front race is 53.6 mm (2.110 in); inner diameter is 30.5 mm (1.201 in).
- Outer diameter of front bearing is 47.7 mm (1.878 in); inner diameter is 32.6 (1.283 in).
- Outer diameter of forward race is 47.0 mm (1.850 in); inner diameter is 26.5 mm 1.043 in).

(3) Install rear race and bearing in gear (Fig. 2).

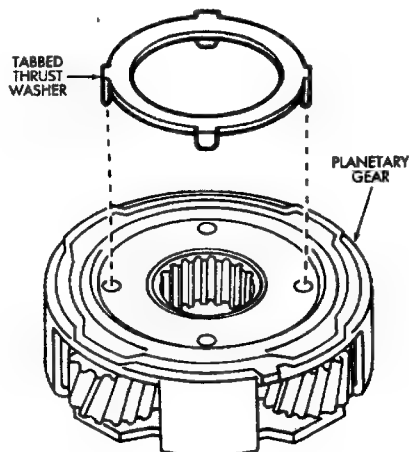
(4) Turn planetary over and install race thrust race (Fig. 3).

(5) Install front race and bearing and forward race in ring gear (Fig. 4).

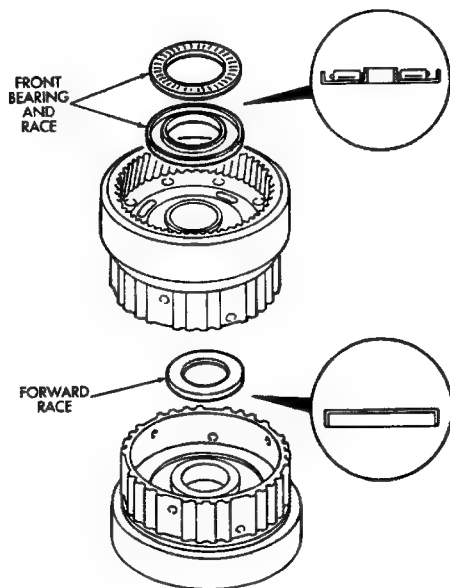
(6) Set planetary gear assembly aside for final assembly.



**Fig. 2 Installing Front Planetary Rear Bearing and Race**



**Fig. 3 Installing Front Planetary Thrust Race**



**Fig. 4 Installing Front Planetary Front Bearing And Races**

## SUN GEAR AND NO. 1 ONE-WAY CLUTCH OVERHAUL

### Sun Gear-Clutch Disassembly

(1) Hold sun gear and turn second brake hub clockwise and counterclockwise (Fig. 2). Hub should rotate freely clockwise, but lock when turned counterclockwise. Replace one-way clutch and hub if it does not operate properly.

(2) Remove one-way clutch/second brake hub assembly from drum (Fig. 3).

(3) Remove thrust washer from drum (Fig. 4).

(4) Remove two seal rings from sun gear (Fig. 5).

(5) Support sun gear on wood block (Fig. 6). Then remove first sun gear snap ring and separate drum from gear.

(6) Remove remaining snap ring from sun gear (Fig. 7).

(7) Measure inside diameter of sun gear bushings with bore gauge or inside micrometer (Fig. 8). Maximum allowable diameter is 27.08 mm (1.0661 in). Replace sun gear if bushing inside diameter is greater than specified.

### Sun Gear-Clutch Assembly

(1) Install first snap ring on sun gear.

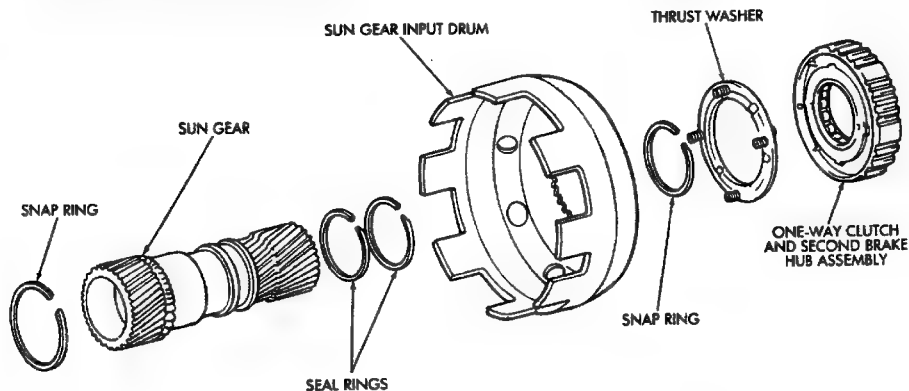
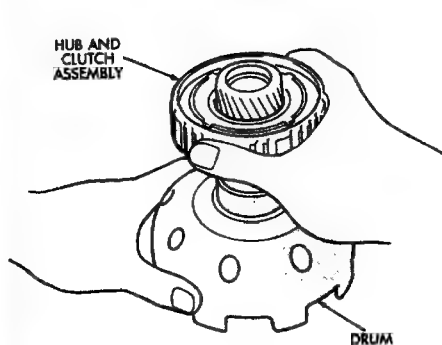
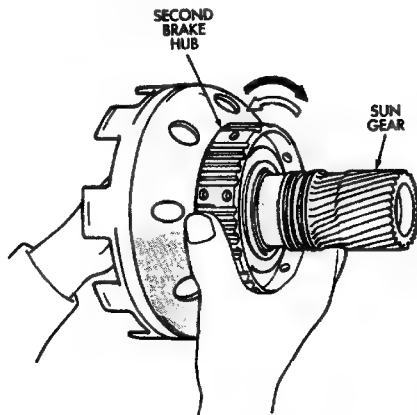


Fig. 1 Sun Gear And One-Way Clutch Components



J8921-589



66 Fig. 2 Checking One-Way Clutch Operation

Fig. 3 Removing/Installing Brake Hub And Clutch Assembly

(2) Install sun gear in drum and install remaining snap ring.

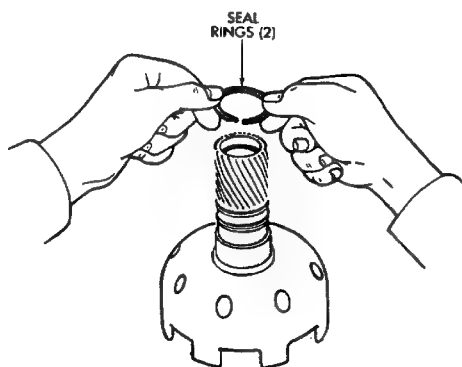
(3) Coat replacement seal rings with petroleum jelly and install them on sun gear. **Be sure seal ring ends are interlocked.**

(4) Install thrust washer. Be sure washer tabs are seated in drum slots.

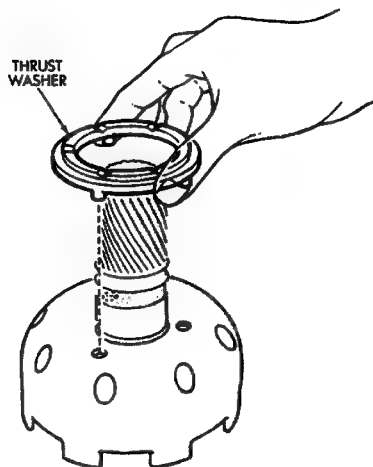
(5) Install one-way clutch/second brake hub assembly on sun gear. Deep side of hub flange faces upward (Fig. 9).

(6) Check one-way clutch operation again (Fig. 2). Hold sun gear and turn second brake hub clockwise and counterclockwise. Hub should turn clockwise freely, but lock when turned counterclockwise.

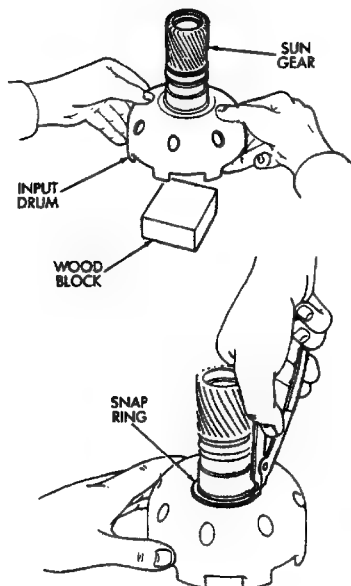
(7) Set sun gear/clutch assembly aside for final assembly.



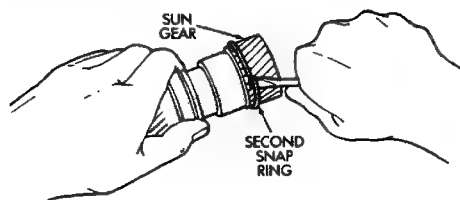
**Fig. 5 Removing/Installing Sun Gear Seal Rings**



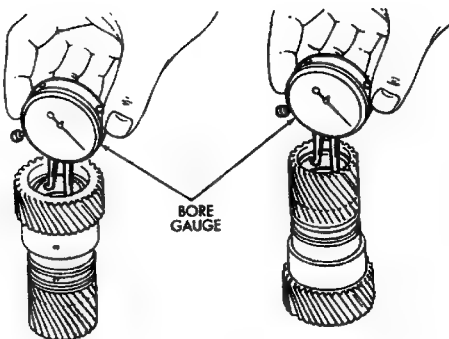
**Fig. 4 Removing/Installing Thrust Washer**



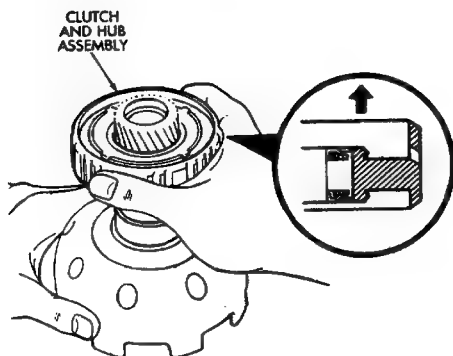
**Fig. 6 Removing/Installing Sun Gear**



**Fig. 7 Removing/Installing Second Snap Ring**



**Fig. 8 Checking Sun Gear Bushings**



**Fig. 9 Installing Clutch And Hub Assembly**

## SECOND BRAKE OVERHAUL

### Brake Disassembly

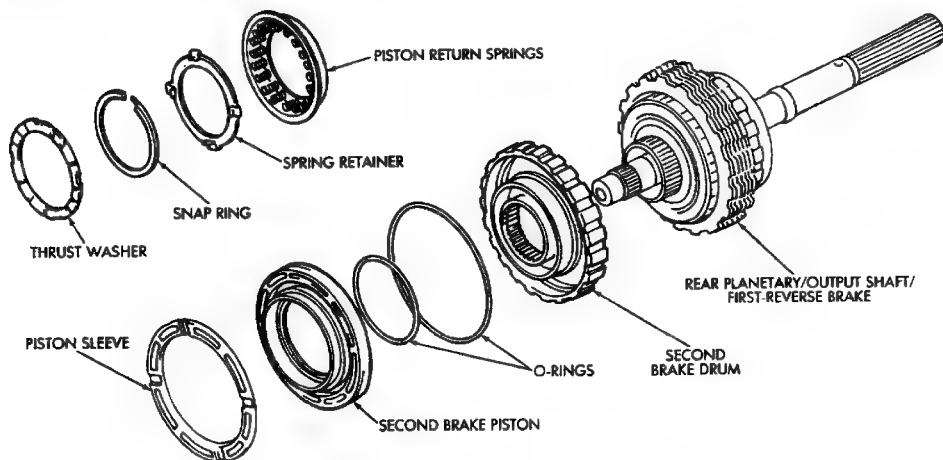
- (1) Remove second brake drum from output shaft (Fig. 2).
- (2) Set output shaft assembly aside for overhaul. Refer to Rear Planetary Gear and Output Shaft Overhaul procedures.
- (3) Remove thrust washer from second brake drum (Fig. 3).

(4) Compress piston return springs with tool B.Vi. FM-27 and shop press. Then remove piston snap ring (Fig. 4).

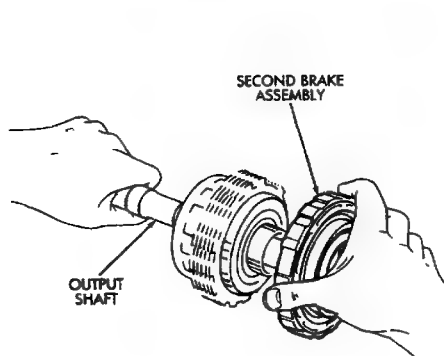
(5) Remove compressor tool and remove spring retainer and return springs.

(6) Remove second brake piston and sleeve from drum with compressed air (Fig. 5). Use only enough air pressure to ease piston out of drum.

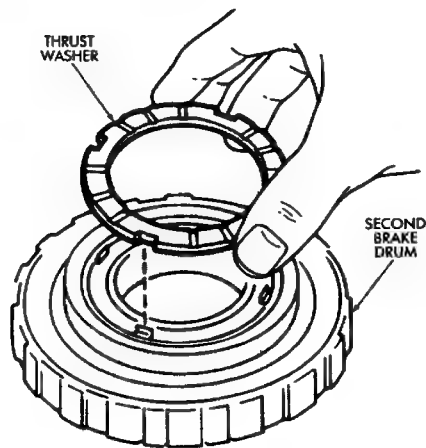
(7) Remove and discard brake piston O-rings.



**Fig. 1 Second Brake Components**



**Fig. 2 Removing/Installing Second Brake Assembly** <sup>69</sup>



**Fig. 3 Removing/Installing Drum Thrust Washer**

(8) Measure free length of piston return springs with springs mounted in retainer (Fig. 6). Length should be 16.05 mm (.632 in). Replace return springs if length is less than specified.

## Second Brake Assembly

(1) Lubricate and install new O-rings on brake piston. Then install brake piston in drum.

(2) Install return springs and retainer on brake piston.

(3) Compress return springs with tool B.Vi. FM-27 and install piston snap ring.

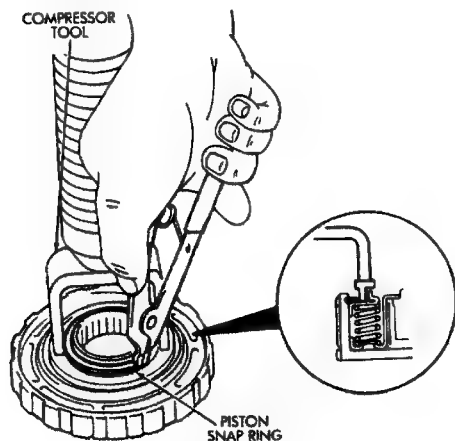


Fig. 4 Removing/Installing Piston Snap Ring

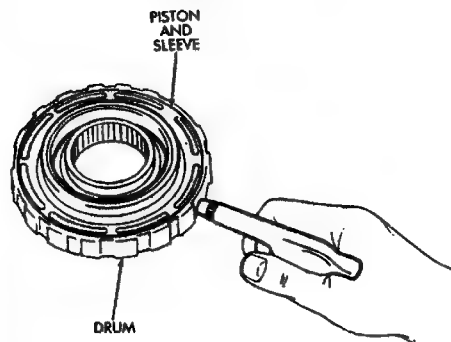


Fig. 5 Removing/Installing Piston And Sleeve

(4) Check brake piston operation with low pressure compressed air (Fig. 7). Apply air pressure through feed hole in drum. Piston should move smoothly when applying-releasing air pressure.

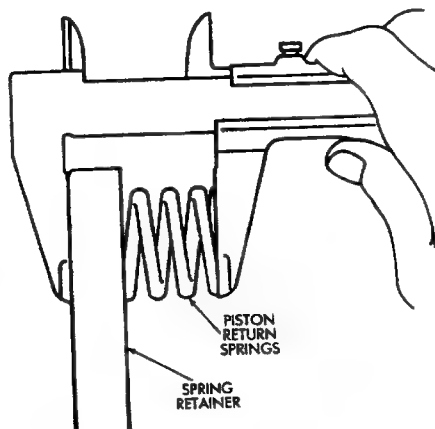


Fig. 6 Measuring Piston Return Springs

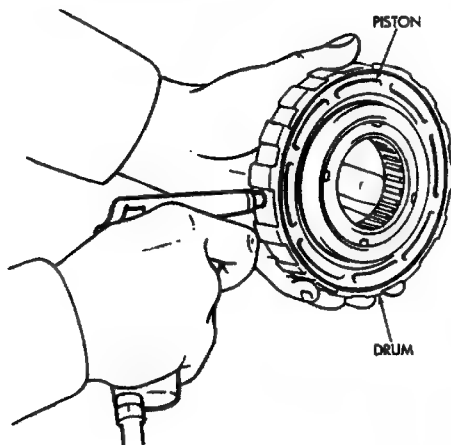
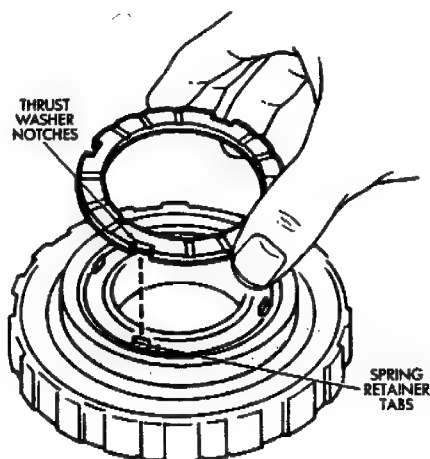


Fig. 7 Checking Piston Operation

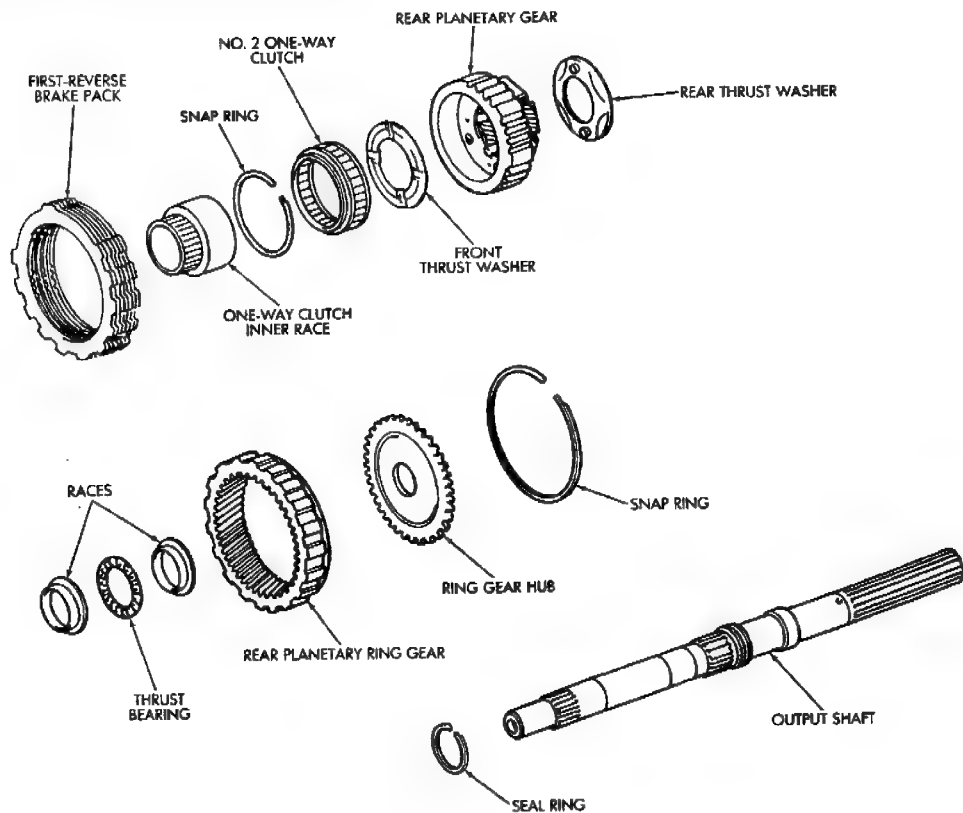
(5) Coat thrust washer with petroleum jelly and install it in drum. Be sure washer notches are aligned with tabs on spring retainer (Fig. 8).

(6) Set brake components aside for final assembly.



*Fig. 8 Installing Thrust Washer*

# REAR PLANETARY, NO. 2 ONE-WAY CLUTCH AND OUTPUT SHAFT OVERHAUL



**Fig. 1 Rear Planetary, Brake Pack, Clutch And Output Shaft Components**



## Planetary-Brake Pack-Shaft Disassembly

- (1) Remove output shaft from gear assembly (Fig. 2).
- (2) Remove and discard shaft seal ring (Fig. 4).
- (3) Remove brake pack from planetary gear (Fig. 4).
- (4) Measure thickness of each brake pack disc. Minimum thickness is 1.51 mm (.0594 in). Replace all discs if any disc is thinner than specified.
- (5) Remove planetary gear from ring gear (Fig. 5).
- (6) Check No. 2 one-way clutch. Hold planetary gear and turn clutch inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise. Replace one-way clutch if necessary.
- (7) Remove clutch inner race from planetary gear (Fig. 7).
- (8) Remove clutch snap ring and remove No. 2 one-way clutch from planetary (Fig. 8).
- (9) Remove front and rear thrust washers from planetary gear (Fig. 9).
- (10) Remove thrust bearing and washers from ring gear (Fig. 10).
- (11) Remove ring gear snap ring and remove ring gear hub (Fig. 11).
- (12) Inspect and replace any worn or damaged planetary gear components.

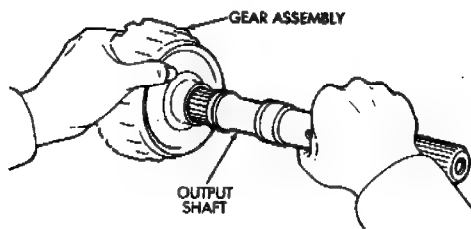


Fig. 2 Removing/Installing Output Shaft

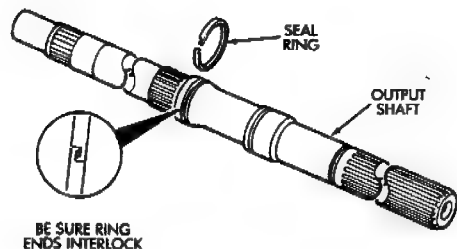


Fig. 3 Removing/Installing Shaft Seal Ring

## Assembling Rear Planetary, Brake Pack, Clutch And Shaft

- (1) Install hub and snap ring in ring gear (Fig. 11)
- (2) Identify ring gear thrust bearing and races races by following dimensions:
  - Outer diameter of bottom race (Fig. 10) is 44.8 mm (1.764 in); inner diameter is 27.6 mm (1.087 in).
  - Outer diameter of bearing (Fig. 10) is 44.7 mm (1.760 in); inner diameter is 30.1 mm (1.185 in).
  - Outer diameter of upper race (Fig. 10) is 44.8 mm (1.764 in); inner diameter is 28.8 mm (1.134 in).
- (3) Lubricate ring gear thrust bearing and races with petroleum jelly and install them in ring gear (Fig. 10).

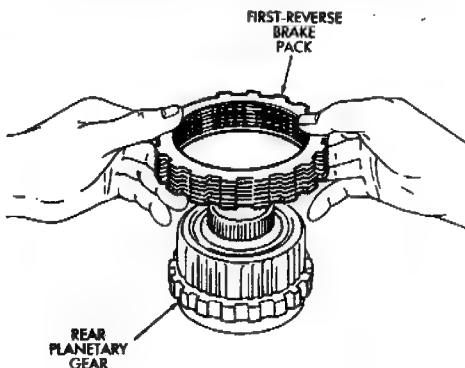


Fig. 4 Removing/Installing First-Reverse Brake Pack

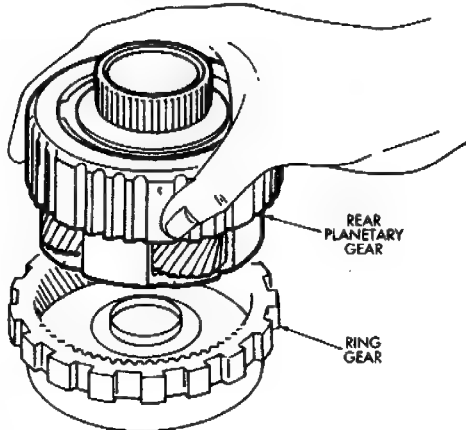


Fig. 5 Removing/Installing Rear Planetary

(4) Coat planetary thrust washers with petroleum jelly and install them in gear (Fig. 9).

(5) Install No. 2 one-way clutch in planetary gear. Be sure flanged side of clutch faces upward (Fig. 12).

(6) Install clutch retaining snap ring and install clutch inner race (Fig. 7). Turn race counterclockwise to ease installation.

(7) Verify one-way clutch operation. Hold gear and turn inner race in both directions. Race should turn freely counterclockwise, but lock when turned clockwise.

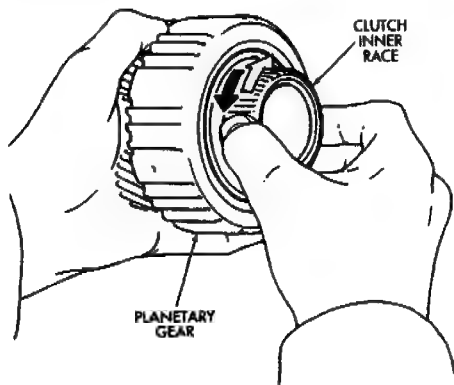
(8) Install planetary gear in ring gear.

(9) Assemble clutch discs and clutch plates (Fig. 4). Sequence is disc first, then a plate. Use seven discs and plates in a 6-cyl. transmission and six discs and plates in a 4-cyl. transmission.

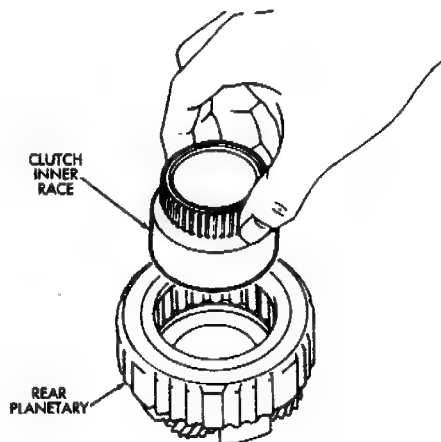
(10) Install brake pack on planetary gear (Fig. 4).

(11) Install new seal ring on output shaft (Fig. 3). Be sure ring ends are interlocked as shown.

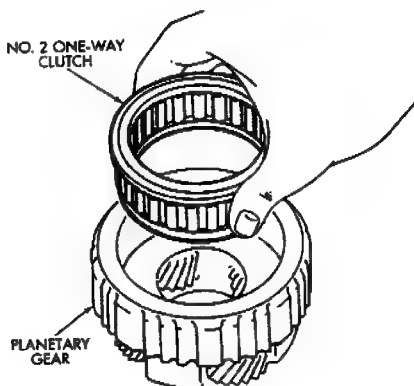
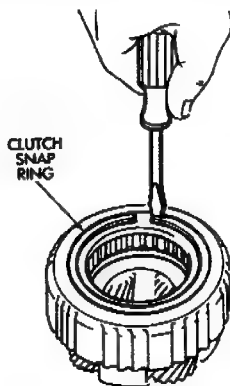
(12) Set assembled components aside for final assembly.



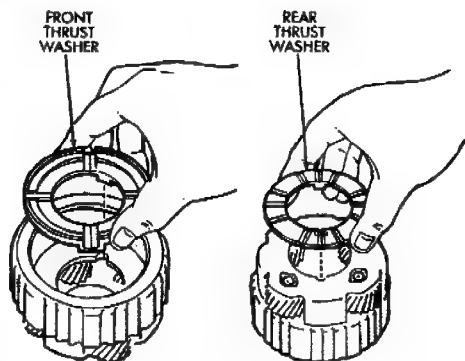
**Fig. 6 Checking No. 2 One-Way Clutch Operation**



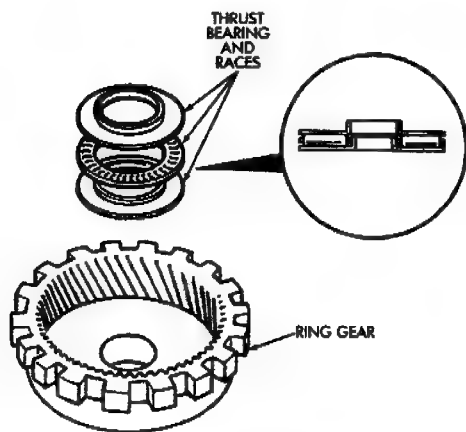
**Fig. 7 Removing/Installing Clutch Inner Race**



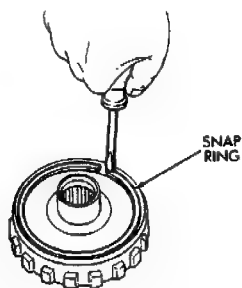
**Fig. 8 Removing/Installing One-Way Clutch**



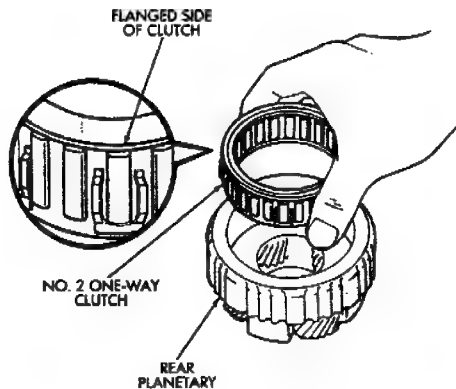
**Fig. 9 Removing/Installing Rear Planetary Thrust Washers**



**Fig. 10 Removing/Installing Ring Gear Thrust Bearing And Races**



**Fig. 11 Removing/Installing Ring Gear Hub**



**Fig. 12 Installing No. 2 One-Way Clutch**

## FIRST-REVERSE BRAKE PISTON AND TRANSMISSION CASE OVERHAUL

### Brake Disassembly-Inspection

- (1) Remove bearing and race assembly from transmission case (Fig. 2).
- (2) Check first/reverse brake piston operation with compressed air (Fig. 3). Piston should move smoothly and not bind or stick. If piston operation is incorrect, case or piston may require replacement.
- (3) Compress piston return springs with tool B.Vi. FM-28 and remove piston snap ring (Fig. 4).

(4) Remove tool B.Vi. FM-28 and remove piston return springs.

(5) Remove No. 2 first-reverse brake piston with compressed air. Apply air through same transmission feed hole used for checking piston operation.

(6) Remove reaction sleeve with tool B.Vi. FM-31 (Fig. 5). Insert tool flanges under sleeve and lift tool and sleeve out of case.

(7) Remove No. 1 first/reverse brake piston with tool B.Vi. FM-32 (Fig. 6). Slip tool under piston and lift tool and piston out of case.

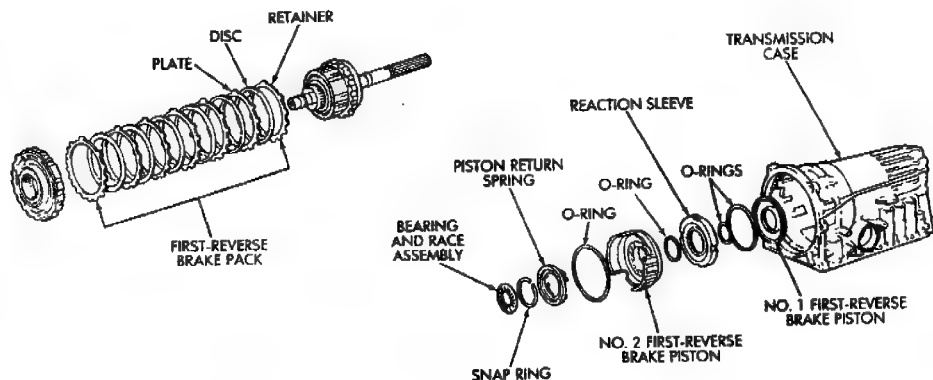


Fig. 1 First-Reverse Brake Pistons And Transmission Case

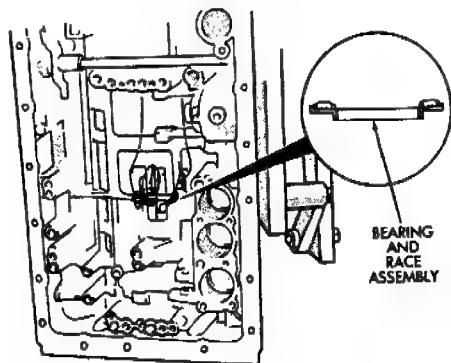


Fig. 2 Removing/Installing Bearing And Race Assembly

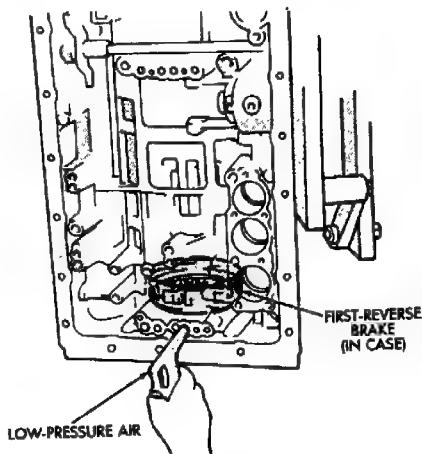


Fig. 3 Checking First-Reverse Brake Piston Operation

(8) Measure free length of piston return springs with springs mounted in retainer. Length should be 18.382 mm (.724 in). Replace springs if length is less than this.

(9) Clean transmission case thoroughly with solvent and dry it with compressed air. Blow compressed air through oil feed passages to remove solvent residue and ensure that passages are clear. Inspect the case for wear or damage. Replace case if necessary.

## Assembling First/Reverse Brake Piston

(1) Lubricate and install new O-rings on No. 1 first/reverse brake piston and on reaction sleeve (Fig. 7). Then install piston in sleeve.

(2) Lubricate and install new O-ring on No. 2 brake piston.

(3) Install assembled No. 1 piston and reaction sleeve on No. 2 piston (Fig. 8).

(4) Lubricate and install piston assembly in case (Fig. 9). Align piston and case slots and press piston assembly into case with hand pressure.

(5) Position piston return springs on No. 2 piston.

(6) Compress piston return springs with tool B.Vi.FM-28 and install piston snap ring. Be sure snap ring end gap is not aligned with any tangs on return spring retainer.

(7) Verify piston operation with compressed air as outlined in disassembly procedure.

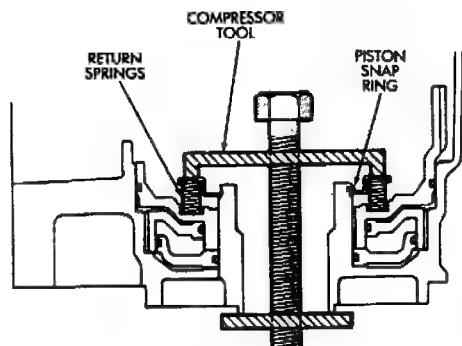


Fig. 4 Removing/Installing Piston Snap Ring

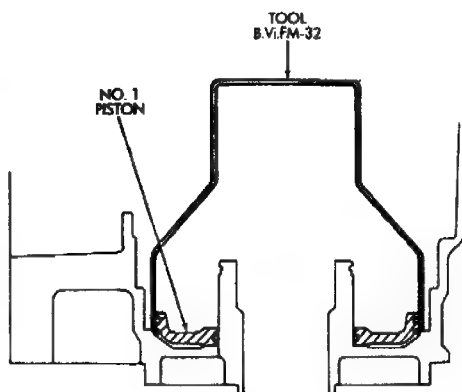


Fig. 6 Removing/Installing First-Reverse Brake No.1 Piston

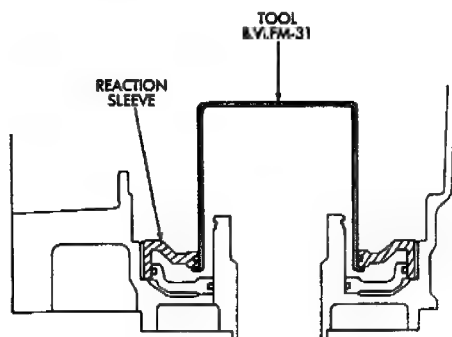


Fig. 5 Removing/Installing Reaction Sleeve

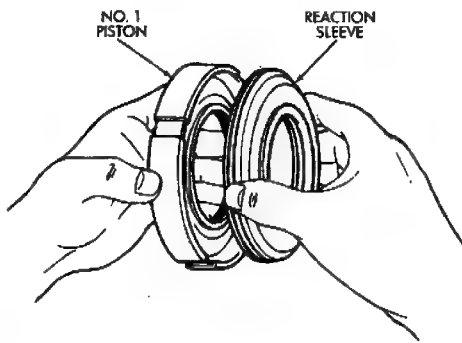
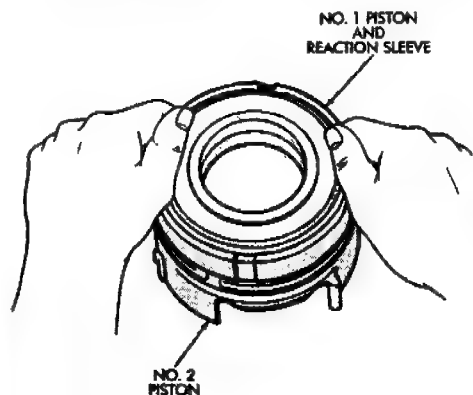


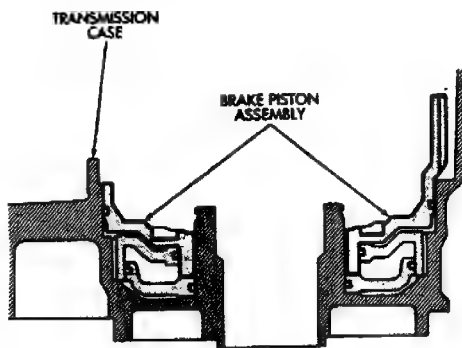
Fig. 7 Assembling No. 1 Piston And Sleeve

(8) Coat bearing and race assembly with petroleum jelly and install it in piston assembly (Fig. 2). Bearing

and race assembly outer diameter is 57.7 mm (2.272 in); inner diameter is 39.2 mm (1.543 in).



**Fig. 8 Assembling First-Reverse Brake Pistons**

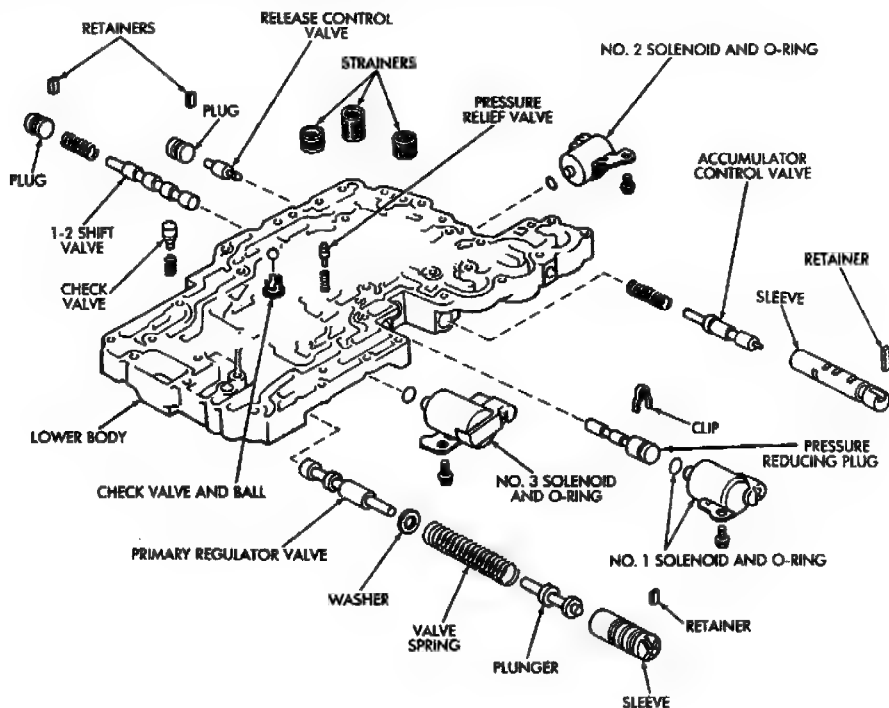


**Fig. 9 Installing First-Reverse Brake Piston Assembly**

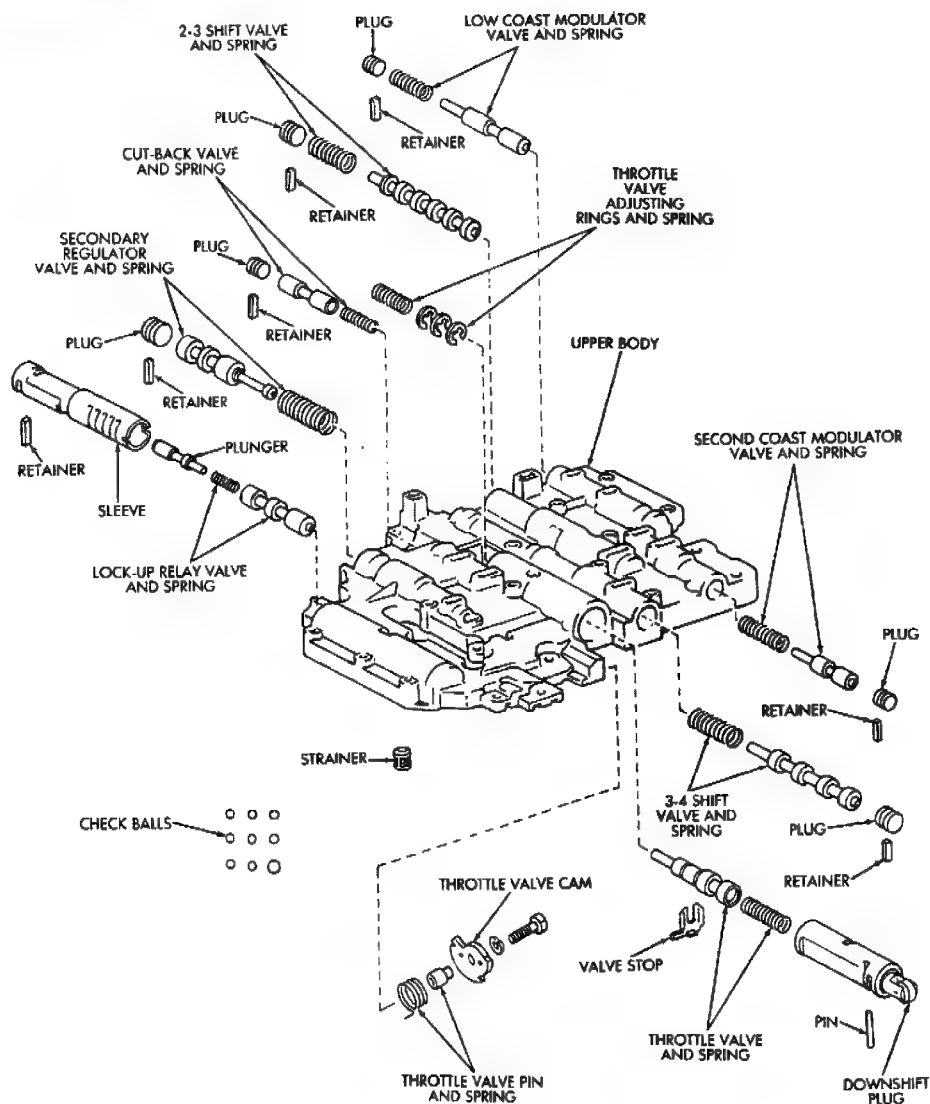
# VALVE BODY OVERHAUL

The valve body assembly consists of two sections which are the upper body and lower body (Figures 1 and

2). Disassembly, inspection and overhaul procedures for each section are outlined separately. Refer to the appropriate procedure as needed.



**Fig. 1 Lower Body Components (Valve Body)**



**Fig. 2 Upper Body Components (Valve Body)**



## Removing Upper Body From Lower Body

- (1) Remove two-piece detent spring (Fig. 3). Note position of spring sections for assembly reference.
- (2) Remove manual valve from lower body (Fig. 4).
- (3) Remove bolts attaching upper body to lower body (Fig. 5).
- (4) Carefully lift and remove upper body, plate and gaskets from lower body (Fig. 6).
- (5) Disassemble and overhaul upper and lower body sections as outlined in following procedures.

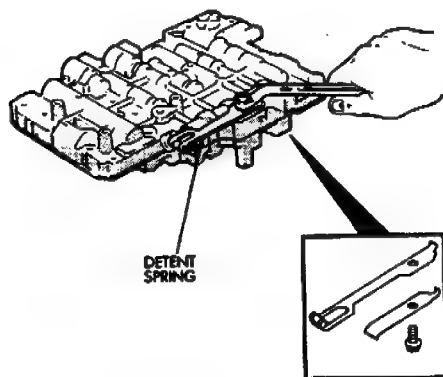


Fig. 3 Removing/Installing Detent Spring

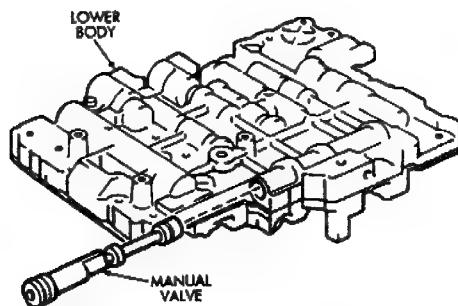


Fig. 4 Removing/Installing Manual Valve

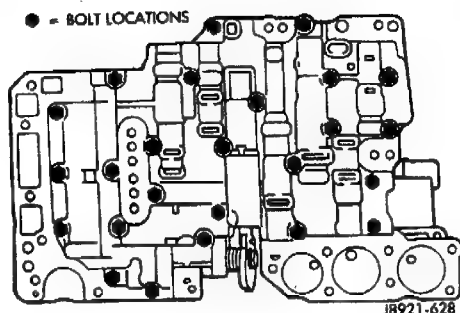


Fig. 5 Valve Body Bolt Locations

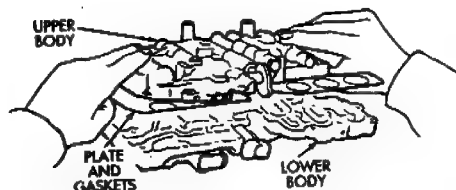


Fig. 6 Upper Body, Plate And Gaskets

## Lower Body Disassembly

(1) Remove check valve and spring, pressure relief valve and spring and ball check and seat from lower body. Note location of each valve for assembly reference.

(2) Remove the oil strainers (Fig. 2).

(3) Note or mark position of valve retainers and pressure reducing plug clip for assembly reference. Do not remove the retainers at this time.

(4) Remove solenoid No. 1, 2 and 3. Discard solenoid O-rings.

(5) Remove release control valve retainer with magnet and remove release control valve and plug (Fig. 4).

(6) Remove 1-2 shift valve retainer and remove valve plug, valve spring and valve (Fig. 5).

(7) Remove primary regulator valve as follows:

**WARNING: THE PRIMARY REGULATOR VALVE SLEEVE AND PLUNGER ARE UNDER TENSION FROM THE VALVE SPRING. EXERT COUNTERPRESSURE ON THE SPRING WHILE REMOVING THE VALVE RETAINER TO PREVENT COMPONENTS FROM FLYING OUT.**

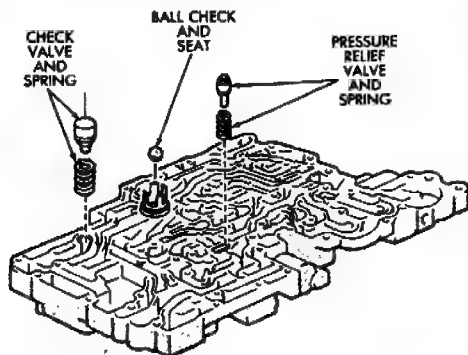


Fig. 1 Removing/Installing Lower Body Check Valves

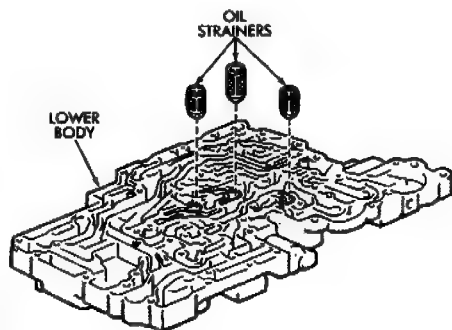


Fig. 2 Removing/Installing Lower Body Oil Strainers

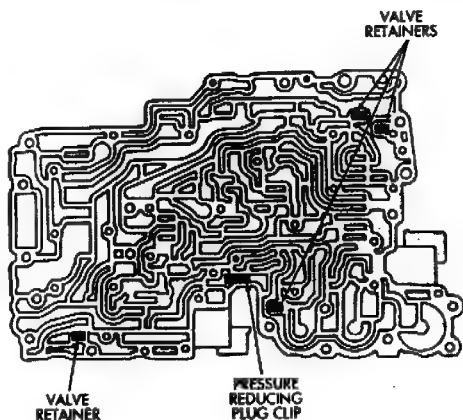


Fig. 3 Valve Retainer And Clip Location

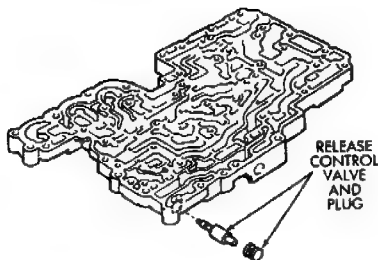
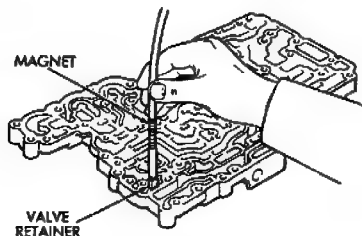


Fig. 4 Removing/Installing Release Control Valve

(a) Note position of valve retainer for assembly reference (Fig. 6). Then press valve sleeve inward with your thumb and remove retainer with magnet.

(b) Slowly release thumb pressure on sleeve and remove sleeve, spring and washer and valve (Fig. 7). Use magnet to remove valve if necessary.

(8) Remove regulator valve plunger from sleeve (Fig. 8).

(9) Remove retaining clip and remove pressure reducing plug (Fig. 9). Cover screwdriver blade with tape to avoid scratching valve body surface.

(10) Remove accumulator control valve retainer and remove control valve assembly (Fig. 10).

(11) Remove spring and control valve from valve sleeve (Fig. 11).

(12) Clean lower body valve components with solvent and dry them with compressed air only. Do not use shop towels or rags. Lint or foreign material from towels or rags can interfere with valve operation.

(13) Inspect condition of lower body components. Replace lower body if any bores are scored or corroded. Replace valves, plugs or sleeves that are scored or worn. Replace oil strainers if cut, torn or damaged in any way.

(14) Inspect the valve body springs. Replace any spring having rusted, distorted, or collapsed coils. Measure the length of each valve body spring. Replace any spring if free length is less than the length specified in the following chart (Fig. 12).

## Lower Body Assembly

(1) Lubricate lower body components with automatic transmission fluid.

(2) Install spring and accumulator control valve in sleeve (Fig. 11). Then install assembled components in lower body (Fig. 10).

(3) Press accumulator control valve assembly into valve bore and install retainer (Fig. 10).

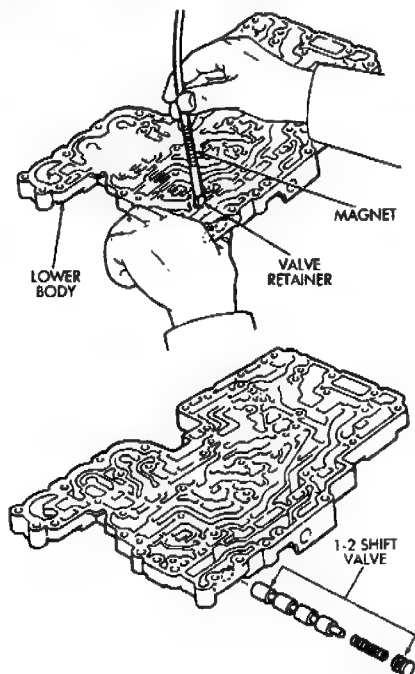


Fig. 5 Removing/Installing 1-2 Shift Valve

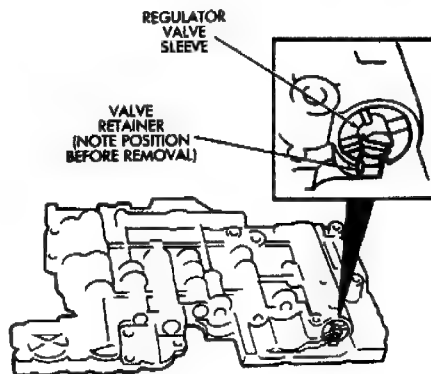


Fig. 6 Regulator Valve Retainer Position

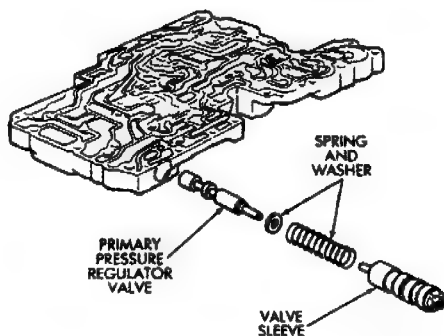


Fig. 7 Removing/Installing Primary Pressure Regulator Valve

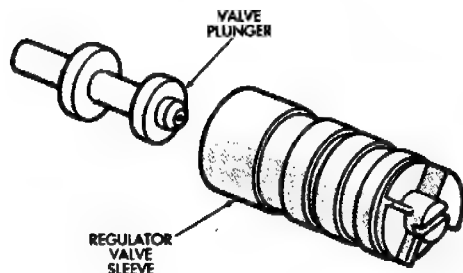
(4) Install pressure reducing plug in plug bore. Then secure plug with retaining clip (Fig. 9).

(5) Install washer on primary regulator valve plunger (Fig. 13).

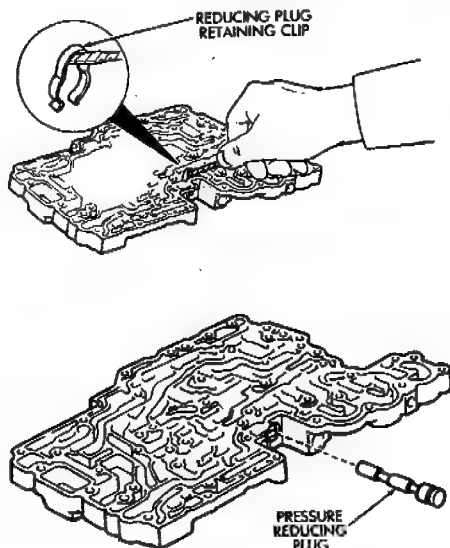
(6) Install primary regulator valve plunger in valve sleeve (Fig. 8).

(7) Install valve spring and regulator valve sleeve and plunger.

(8) Press regulator valve sleeve into bore and install retainer (Fig. 6 and 7). Be sure retainer is positioned in sleeve lugs as shown.



**Fig. 8 Removing/Installing Regulator Valve Plunger**



**Fig. 9 Removing/Installing Pressure Reducing Plug**

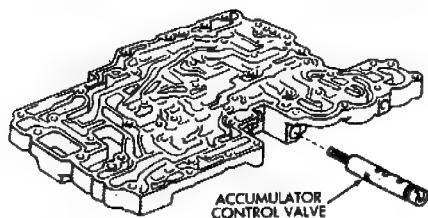
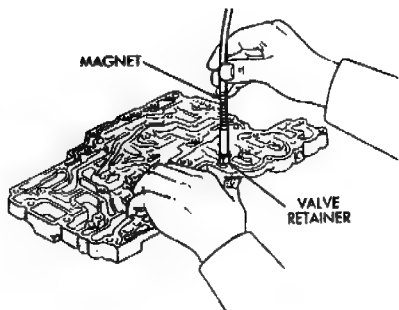
(9) Install 1-2 shift valve, spring and plug (Fig. 5). Then press valve assembly into bore and install retainer.

(10) Install release control valve and plug in bore and install valve retainer (Fig. 4).

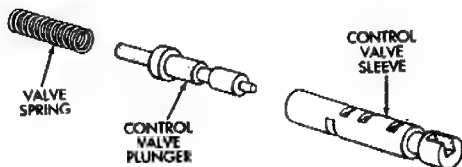
(11) Install replacement O-rings on solenoids and install solenoids on valve body. Tighten solenoid attaching bolts to 10 N·m (7 ft-lbs) torque.

(12) Install oil strainers (Fig. 14). **Identify strainers before installation. The three strainers are all the same diameter but are different lengths. Two strainers are 11.0 mm (.443 in) long while one strainer is 19.5 mm (.76 in) long (Fig. 14).**

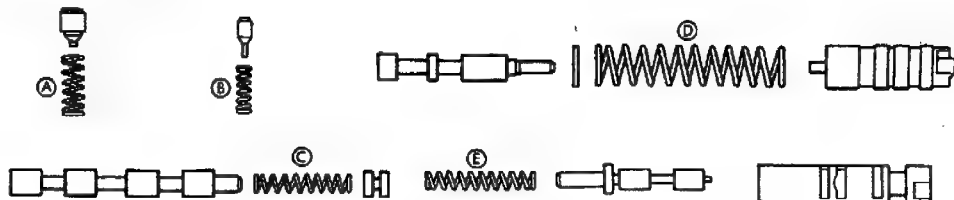
(13) Install check valves and springs/seats (Fig. 1)



**Fig. 10 Removing/Installing Accumulator Control Valve Assembly**

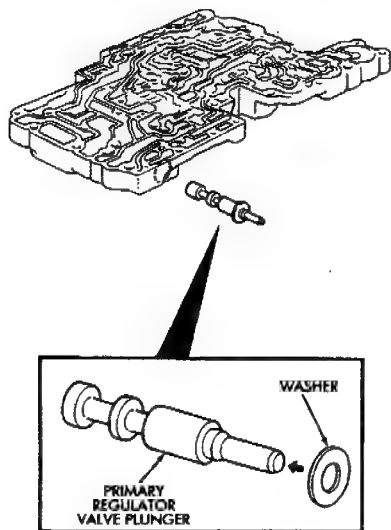


**Fig. 11 Accumulator Control Valve Components**

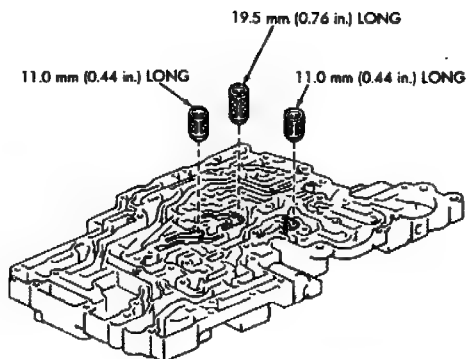


Spring	Free Length
(A) Check Valve	20.2 mm (0.801 in.)
(B) Pressure Relief Valve	11.2 mm (0.441 in.)
(C) 1-2 Shift Valve	30.8 mm (1.213 in.)
(D) Primary Regulator Valve	66.7 mm (2.626 in.)
(E) Accumulator Control Valve	36.1 mm (1.421 in.)

**Fig. 12 Lower Body Valve Spring Dimensions**



**Fig. 13 Installing Washer On Regulator Valve Plunger**



**Fig. 14 Oil Strainer Identification**

## Upper Body Disassembly and Inspection

- (1) Remove valve body plate and gaskets (Fig. 1). Discard gaskets.
- (2) Remove strainer and nine check balls (Fig. 2). Note check ball and strainer position for assembly reference.
- (3) Remove valve stop and throttle cam (Fig. 3).
- (4) Remove throttle valve pin with magnet and remove downshift plug, valve spring and throttle valve (Fig. 4).

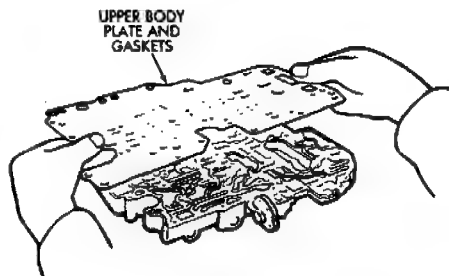


Fig. 1 Removing/Installing Upper Body Plate And Gaskets

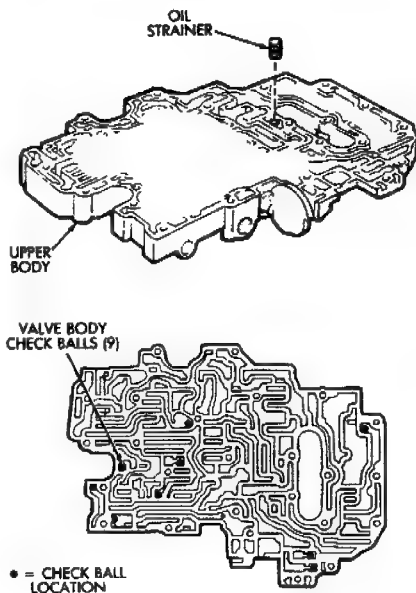


Fig. 2 Check Ball And Strainer Location

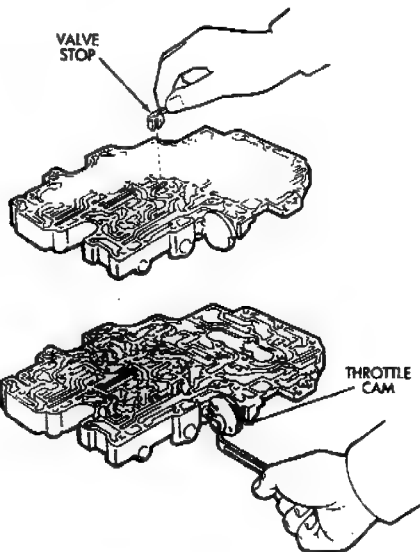


Fig. 3 Removing/Installing Valve Stop And Throttle Cam

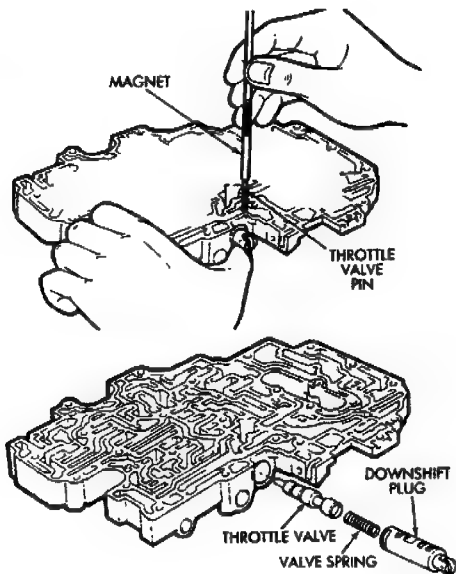
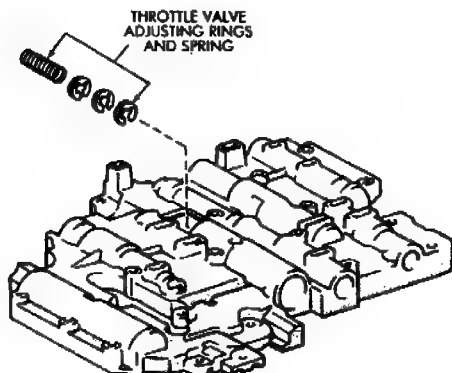
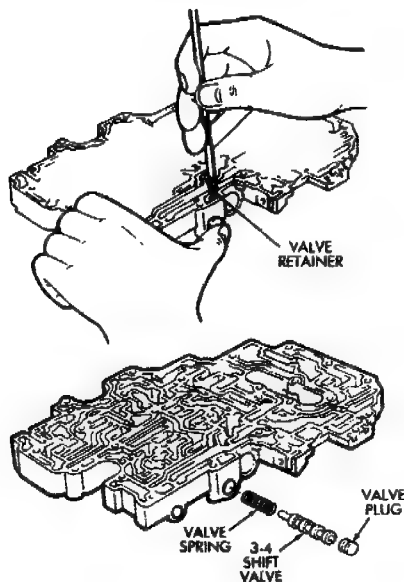


Fig. 4 Removing/Installing Throttle Valve

(5) Turn upper body over and remove throttle valve adjusting rings and spring (Fig. 5). Note number of adjusting rings if valve is equipped with them.



**Fig. 5 Throttle Valve Adjusting Ring Location (If Equipped)**



**Fig. 6 Removing/Installing 3-4 Shift Valve**

(6) Remove 3-4 shift valve retainer with magnet and remove valve plug, spring and 3-4 shift valve (Fig. 6).

(7) Remove second coast modulator valve retainer and remove valve plug, spring and valve.

(8) Remove lock-up relay valve retainer and remove relay valve and sleeve assembly (Fig. 8).

(9) Remove lock-up relay valve, spring and plunger from valve sleeve (Fig. 9).

(10) Remove secondary pressure regulator valve retainer and remove plug, regulator valve and spring (Fig. 10).

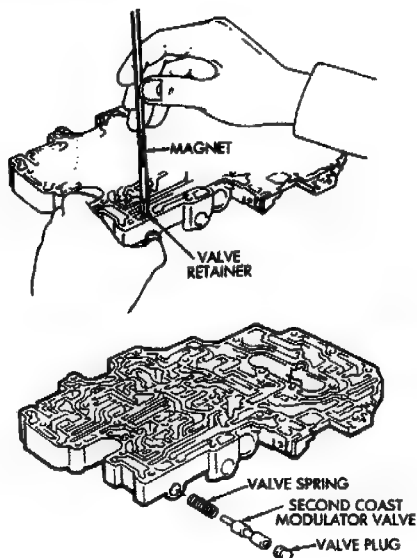
(11) Remove cut-back valve retainer and remove plug, cut-back valve and spring (Fig. 11).

(12) Remove 2-3 shift valve retainer and remove plug, spring and 2-3 shift valve (Fig. 12).

(13) Remove low coast modulator valve retainer and remove valve plug, spring and low coast modulator valve (Fig. 13).

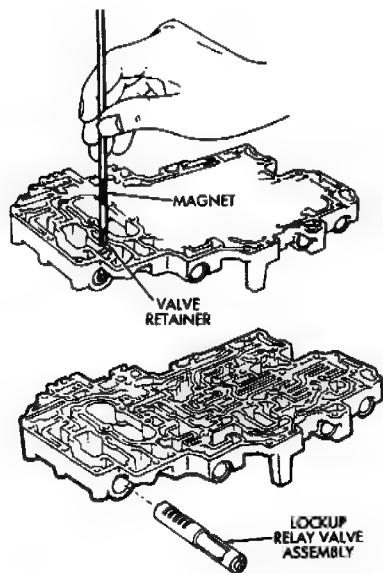
(14) Clean the upper body components with solvent and dry them with compressed air only. Do not use shop towels or rags. Lint or foreign material from towels or rags can interfere with valve operation.

(15) Inspect condition of the upper body components. Replace the upper body if any of the bores are scored or corroded. Replace any valves, plugs or sleeves if scored or worn. Replace the oil strainer if cut, torn or damaged in any way.

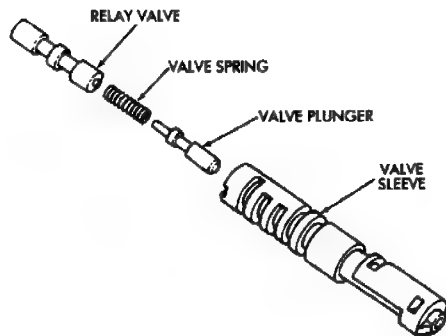


**Fig. 7 Removing/Installing Second Coast Modulator Valve**

(16) Inspect the valve body springs. Replace any spring having rusted, distorted, or collapsed coils. Measure length of each spring. Replace any spring if free length is less than specified in the chart (Fig. 14).



**Fig. 8 Removing/Installing Lockup Relay Valve**



**Fig. 9 Lockup Relay Valve Components**

## Upper Body Assembly

(1) Lubricate the valves, springs, plugs, sleeves and the valve bores in the upper body with automatic transmission fluid.

(2) Note position of the valve retainers (A) and stop (B) for assembly reference (Fig. 15).

(3) Install low coast modulator valve, spring and plug in valve bore. Press valve plug inward and install retainer (Fig. 13).

(4) Install 2-3 shift valve, spring and plug in valve bore. Press plug inward and install retainer (Fig. 12).

(5) Install cut-back valve spring, valve and plug (Fig. 11). Press plug inward and install retainer.

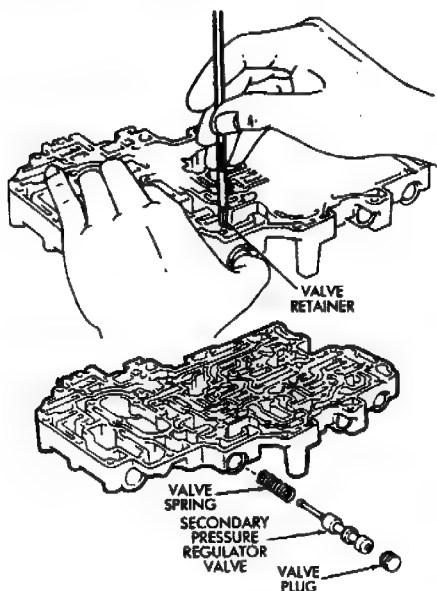
(6) Install secondary regulator valve spring, valve and plug in valve bore. Press plug inward and install retainer (Fig. 10).

(7) Assemble lock-up relay valve. Install spring and plunger in valve sleeve (Fig. 9). Then install assembled valve in sleeve.

(8) Install assembled lock-up relay valve in valve bore and install retainer (Fig. 8).

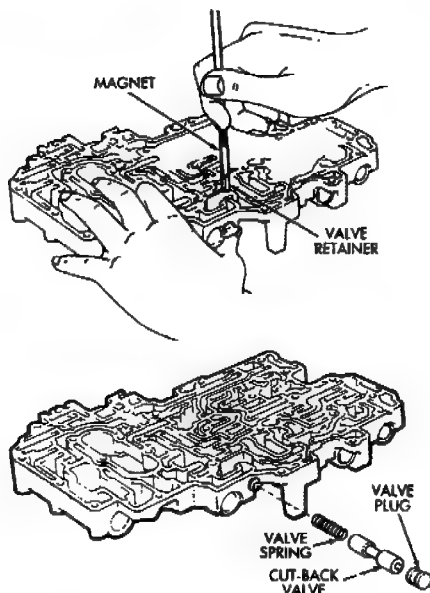
(9) Install second coast modulator valve, spring and plug in valve bore. Press plug inward and install retainer (Fig. 7).

(10) Install 3-4 shift valve, spring and plug in bore. Press plug inward and install retainer (Fig. 6).

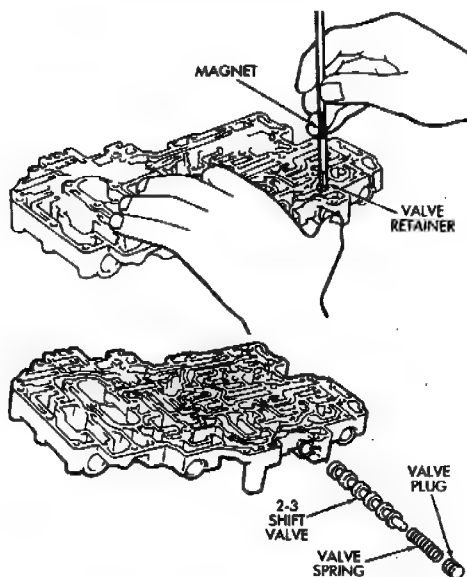


**Fig. 10 Removing/Installing Secondary Pressure Regulator Valve**



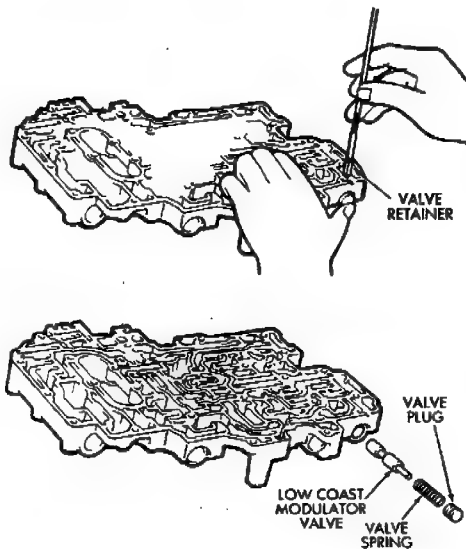


**Fig. 11 Removing/Installing Cut-Back Valve**

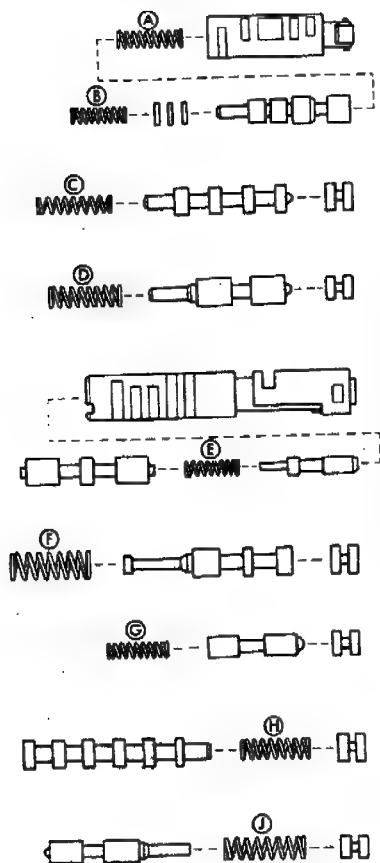


**Fig. 12 Removing/Installing 2-3 Shift Valve**

- (11) Install throttle valve in valve bore. Push valve into place and install valve stop (Fig. 16).
- (12) On models with adjusting rings, turn upper body over and install adjusting rings (Fig. 17). Be sure to install same number of rings as were removed.
- (13) Install throttle valve adjusting spring in bore and onto end of throttle valve (Fig. 18).
- (14) Install downshift spring and plug in throttle valve bore. Press plug inward against throttle valve and spring and install the retainer pin (Fig. 19).
- (15) Install sleeve in throttle cam (Fig. 20).
- (16) Install spring on cam (Fig. 20). Hook curved end of spring through hole in cam as shown.
- (17) Mount cam on upper body and install cam attaching bolt and spacer (Fig. 20). Tighten bolt to 10 N·m (7 ft-lbs) torque.
- (18) Be sure straight end of spring is seated in upper body slot as shown (Fig. 20).
- (19) Install check balls in upper body (Fig. 21). Refer to illustration for check ball identification and location.
- (20) Install oil strainer (Fig. 2).



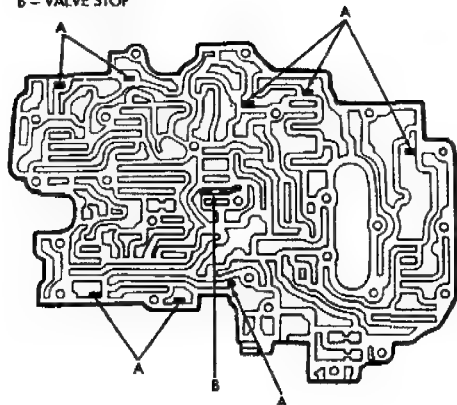
**Fig. 13 Removing/Installing Low Coast Modulator Valve**



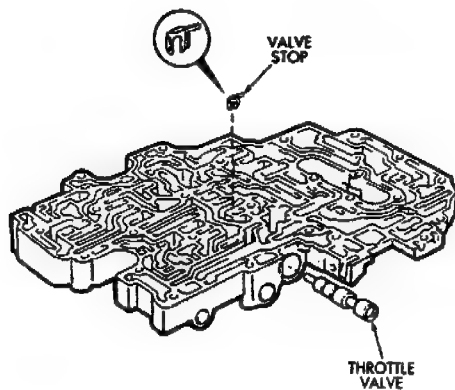
Spring	Free Length
(A) Downshift Plug	27.3 mm (1.074 in.)
(B) Throttle Valve	20.6 mm (0.811 in.)
(C) 3-4 Shift Valve	30.8 mm (1.212 in.)
(D) Second Coast Modulator Valve	25.3 mm (0.996 in.)
(E) Lockup Relay Valve	21.4 mm (0.843 in.)
(F) Second Regulator Valve	30.9 mm (1.217 in.)
(G) Cut-Back Valve	21.8 mm (0.858 in.)
(H) 2-3 Shift Valve	30.8 mm (1.212 in.)
(I) Low Coast Modulator Valve	27.8 mm (1.094 in.)

**Fig. 14 Upper Body Spring/Valve Identification**

A - VALVE RETAINERS  
B - VALVE STOP

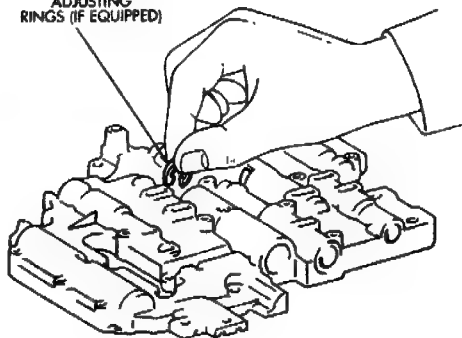


**Fig. 15 Valve Retainer And Stop Locations**



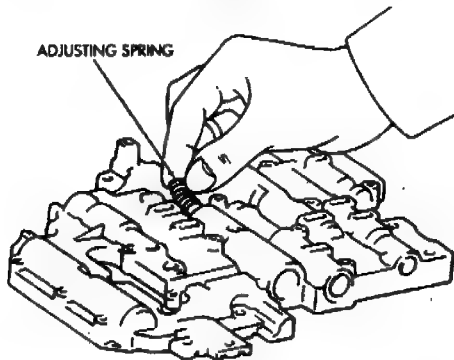
**Fig. 16 Installing Throttle Valve And Stop**

ADJUSTING  
RINGS (IF EQUIPPED)

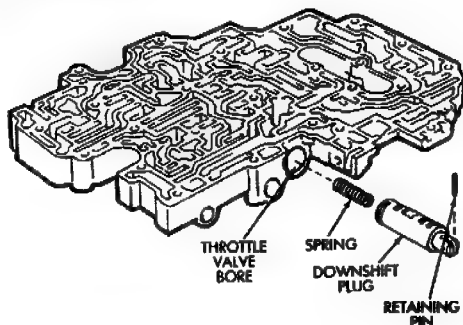


**Fig. 17 Install Throttle Valve Adjusting Rings - If Equipped**

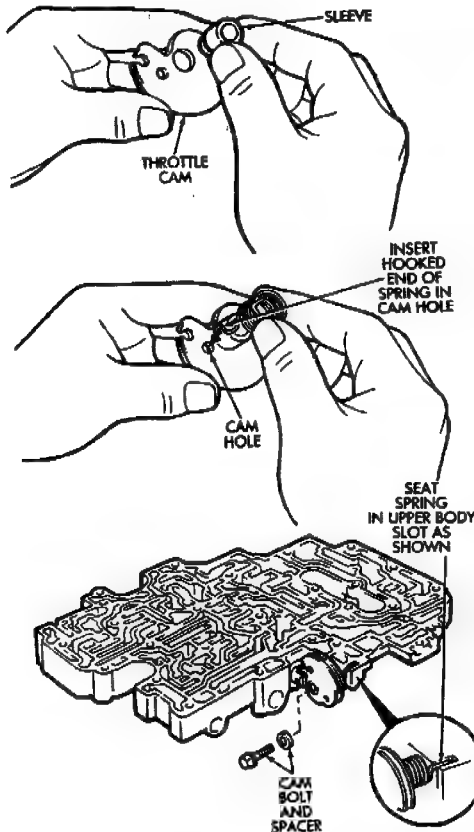
ADJUSTING SPRING



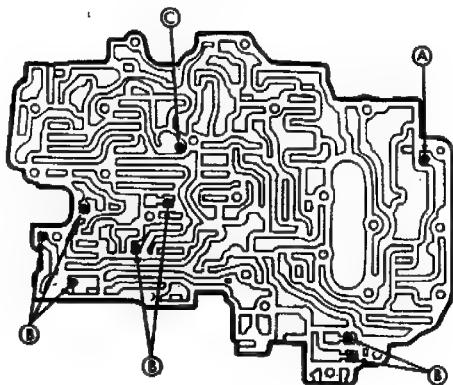
**Fig. 18 Installing Throttle Valve Adjusting Spring**



**Fig. 19 Installing Downshift Plug**



**Fig. 20 Installing Throttle Cam**

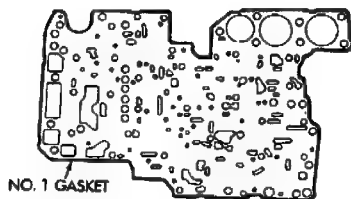


Check Ball	Diameter
A Rubber Ball	6.35 mm (0.2500 in.)
B Steel Ball	5.56 mm (0.2189 in.)
C Steel Ball	7.14 mm (0.2811 in.)

**Fig. 21 Upper Body Check Ball Location/Identification**

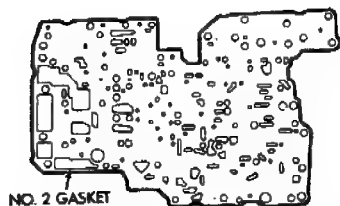
## Installing Upper Body On Lower Body

- (1) Position new No. 1 gasket (Fig. 1) on upper body.
- (2) Position valve body plate on No. 1 gasket.
- (3) Position new No. 2 gasket (Fig. 2) on valve body plate and align gaskets and plate using bolt holes as guides.
- (4) Install valve body bolts. Three different length bolts are used. Refer to the Figure 3 for bolt locations. Chart symbols indicate bolt location and length in millimeters.
- (5) Tighten valve body bolts to 6.4 N·m (56 in-lbs) torque.

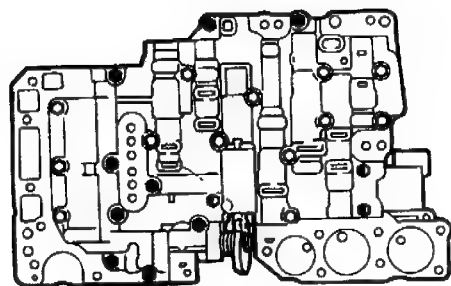


**Fig. 1 Valve Body Gasket No. 1**

- (6) Install manual valve (Fig. 4).
- (7) Install two-piece detent spring (Fig. 5). Tighten spring attaching bolt to 10 N·m (7 ft-lbs) torque.



**Fig. 2 Valve Body Gasket No. 2**

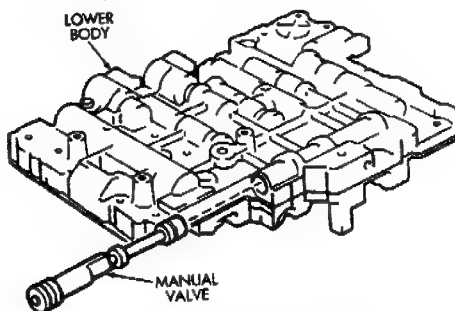


38 mm  
(1.5 in.)

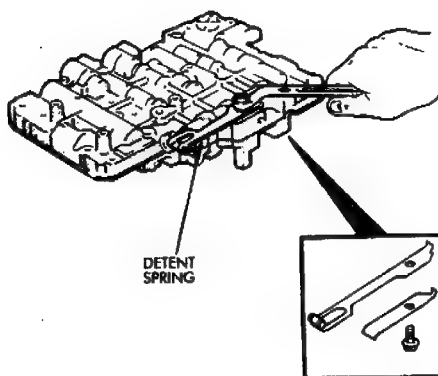
20 mm  
(0.787 in.)

28 mm  
(1.10 in.)

**Fig. 3 Valve Body Bolt Location/Size**



**Fig. 4 Installing Manual Valve**



**Fig. 5 Installing Detent Spring**

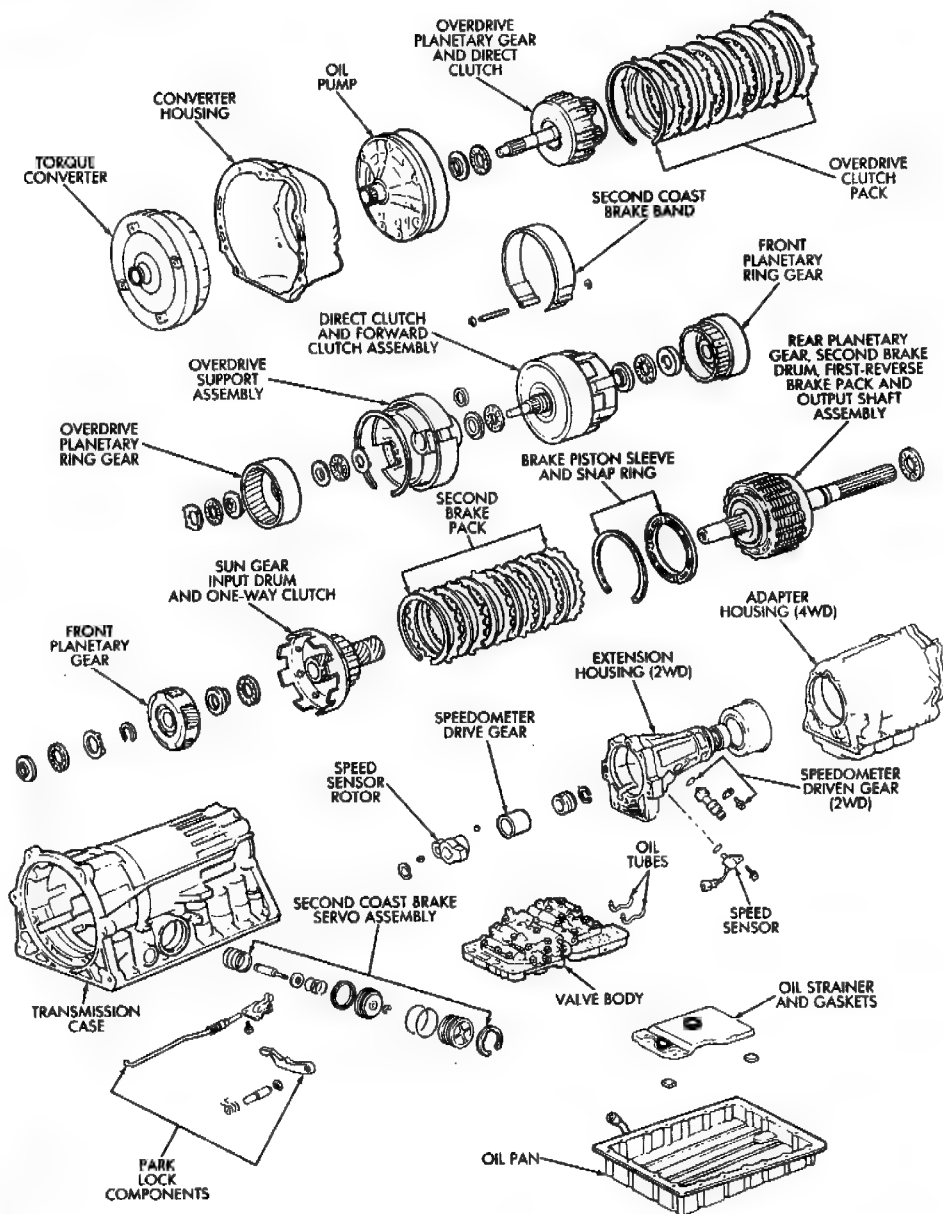
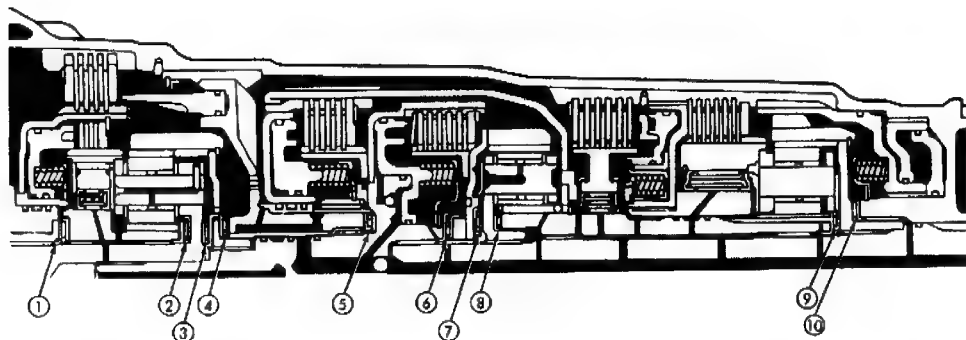
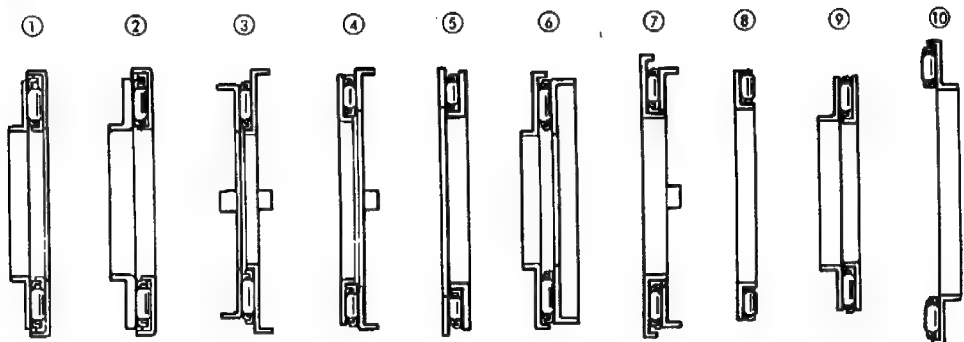


Fig. 1 AW-4 Transmission Components



**Fig. 2 Thrust Bearing Chart**

## TRANSMISSION ASSEMBLY

(1) During assembly, lubricate components with transmission fluid or petroleum jelly as indicated.

(2) If any of the transmission components are still assembled after overhaul checking procedures, disassemble as necessary in preparation for transmission assembly.

(3) Verify thrust bearing and race installation during assembly. Refer to the Thrust Bearing Chart (Fig. 2) for bearing and race location and correct positioning.

(4) Install rear planetary gear, second brake drum and output shaft as outlined in following steps:

(5) Verify No. 10 thrust bearing and race (Fig. 2). Bearing and race outer diameter is 57.7 mm (2.272 in); inside diameter is 39.2 mm (1.543 in).

(6) Coat thrust bearing and race assembly with petroleum jelly and install in case (Fig. 3). Race faces down. Bearing rollers face up.

(7) Align teeth of second brake drum and clutch pack (Fig. 4).

(8) Align rear planetary-output shaft assembly teeth with case slots and install assembly in case (Fig. 5).

(9) Install rear planetary snap ring with snap ring pliers B.Vi. FM- 29. Chamfered side of snap ring faces up and toward case front (Fig. 6).

(10) Check first-reverse brake pack clearance with feeler gauge. Clearance should be: 0.6 to 1.74 mm (.024 to .069 in) on 4-cyl. transmissions and .70 to 2.00 mm (.028 to .079 in) on 6-cyl. transmissions. If clearance is incorrect, planetary assembly, thrust bearing or snap ring is not properly seated in case. Remove and reinstall components if necessary.

(11) Install second brake piston sleeve (Fig. 8). Sleeve lip faces up and toward case front as shown.

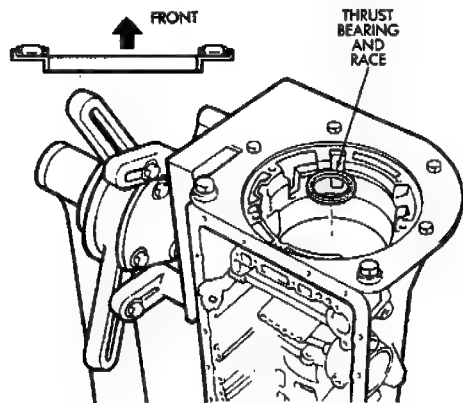
(12) Install second brake drum gasket with tool B.Vi. FM-33 (Fig. 9). Gasket depth is 43.7 mm (1.720 in).

(13) Install park lock pawl, spring and pin (Fig. 10).  
 (14) Connect park lock rod to manual valve shift sector (Fig. 11).

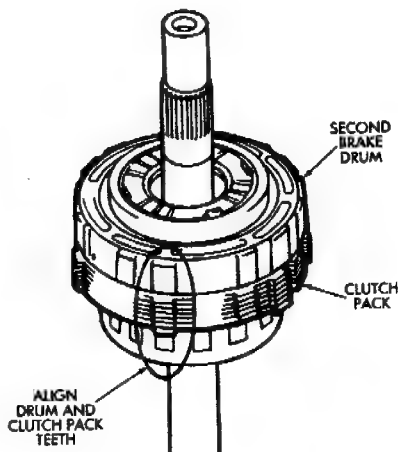
(15) Position park lock rod bracket on case and tighten bracket attaching bolts to 10 N·m (7 ft-lbs) torque (Fig. 12).

(16) Verify park lock operation. Move shift sector to Park position. Park pawl should be firmly engaged (locked) in planetary ring gear (Fig. 13).

(17) Install No. 1 one-way clutch (Fig. 14). Short flanged side of clutch faces up and toward case front.



**Fig. 3 Installing Thrust Bearing And Race (No. 10)**



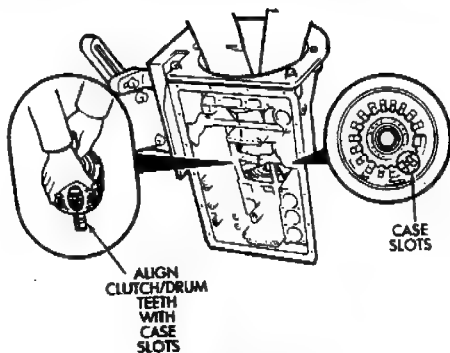
**Fig. 4 Align Drum And Clutch Pack Teeth**

(18) Install second brake pack (Fig. 15). Install disc then plate. Continue installation sequence until correct number of discs-plates are installed. Use five discs and five plates in 6-cyl. transmissions and four discs and four plates in 4-cyl. transmissions.

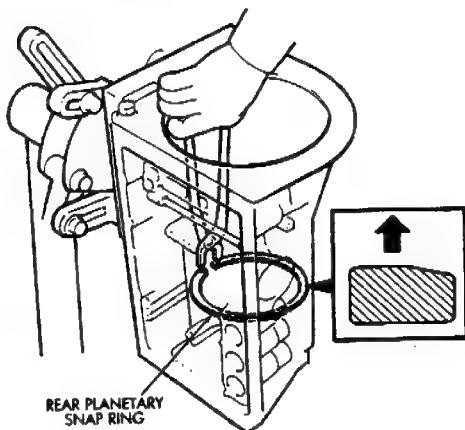
(19) Install second brake pack retainer with rounded edge of retainer facing disc.

(20) Install second brake pack snap ring.

(21) Check brake pack clearance with feeler gauge (Fig. 16). Clearance should be: .89 to 2.15 mm (.035 to .084 in) on 4-cyl. transmissions and .062 to 1.98 mm (.024 to .078 in) on 6-cyl. transmissions. If brake pack clearance is not correct, brake pack components are not seated. Reassemble brake pack if necessary.



**Fig. 5 Installing Output Shaft/Rear Planetary Assembly**



**Fig. 6 Installing Planetary Snap Ring**



(22) Install planetary sun gear and input drum (Fig. 17). Be sure drum thrust washer tabs are seated in drum. Use petroleum jelly to hold thrust washer in position if necessary.

(23) Install front planetary gear on sun gear (Fig. 18).

(24) Support output shaft with wood blocks (Fig. 19).

(25) Install planetary snap ring on sun gear with tool B.Vi. FM-30.

(26) Install tabbed thrust race on front planetary gear (Fig. 21). Washer tabs face down and toward gear. Race outer diameter is 47.8 mm (1.882 in); inside diameter is 34.3 mm (1.350 in).

(27) Install second coast brake band (Fig. 22).

(28) Install pin in second coast brake band. Then install retaining ring on pin (Fig. 23).

(29) Install thrust bearing and race in forward-direct clutch (Fig. 24). Coat bearing/race with petroleum jelly to hold them in place.

(30) Verify forward-direct clutch thrust bearing size. Race outer diameter is 48.9 mm (1.925 in); inside diameter is 26.0 mm (1.024 in). Bearing outer diameter is 46.7 mm (1.839 in); inside diameter is 26.0 mm (1.024 in).

(31) Coat front planetary ring gear race with petroleum jelly and install it in ring gear (Fig. 25).

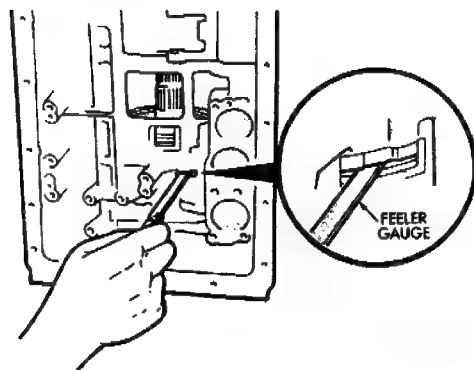


Fig. 7 Checking First-Reverse Brake Pack Clearance

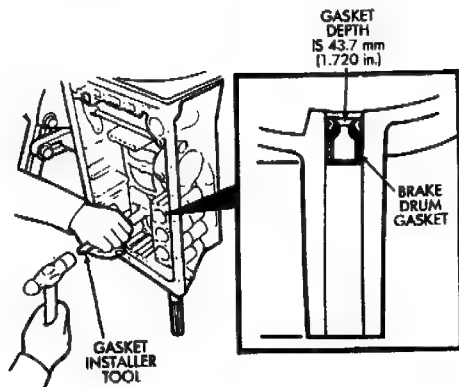


Fig. 9 Installing Second Brake Drum Gasket

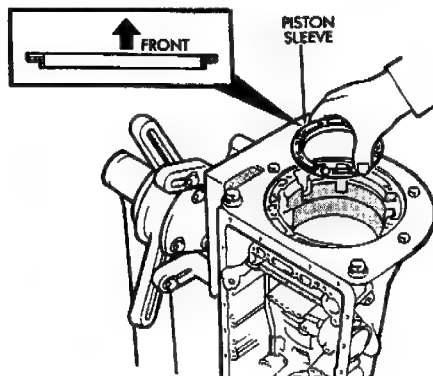


Fig. 8 Installing Second Brake piston Sleeve

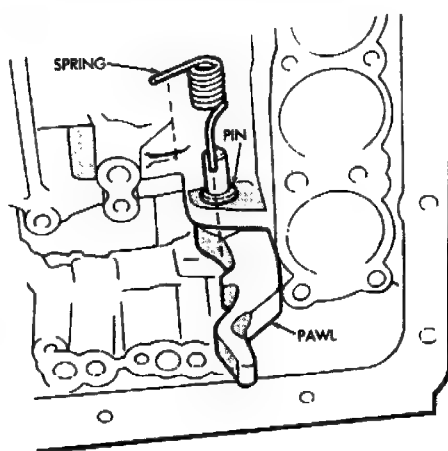


Fig. 10 Installing Park Lock Pin/Spring/Pawl

(32) Verify ring gear race size. Outer diameter is 47.0 mm (1.850 in); inside diameter is 26.5 mm (1.045 in).

(33) Align forward-direct clutch disc splines with screwdriver (Fig. 26).

(34) Align and install front planetary ring gear in forward-direct clutch (Fig. 27).

(35) Coat bearing and race with petroleum jelly and install them in ring gear (Fig. 28). Verify bearing/race size. Bearing outer diameter is 47.7 mm (1.878 in); inside diameter is 32.6 mm (1.283 in). Race outer diameter is 53.6 mm (2.110 in); inside diameter is 30.6 mm (1.205 in).

(36) Rotate front of transmission case downward and install assembled planetary gear/forward-direct clutch (Fig. 29).

(37) Check clearance between sun gear input drum and direct clutch drum (Fig. 30). Clearance should be 9.8 to 11.8 mm (.386 to .465 in). If clearance is incorrect,

planetary gear/forward-direct clutch assembly is not seated or is improperly assembled. Remove, and correct if necessary.

(38) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch shaft. Bearing faces up and toward case front as shown (Fig. 31). Verify bearing/race size. Bearing and race outer diameter is 47.8 mm (1.882 in); inside diameter is 33.6 mm (1.301 in).

(39) Assemble second coast brake piston components (Fig. 32).

(40) Install assembled second coast brake piston in case.

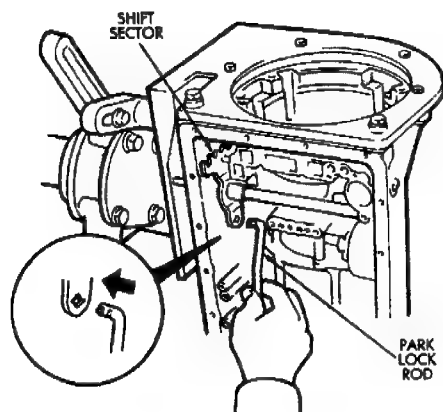


Fig. 11 Installing Park Lock Rod

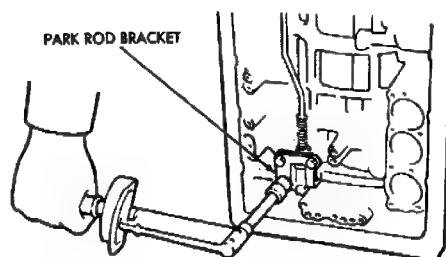


Fig. 12 Installing Park Rod Bracket

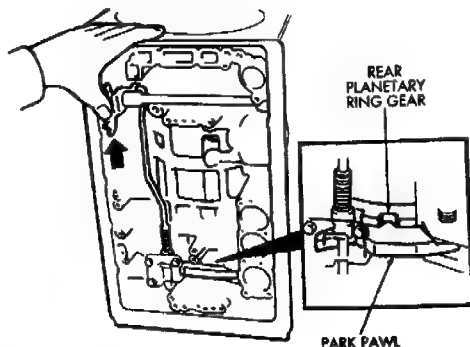


Fig. 13 Checking Park Pawl Engagement

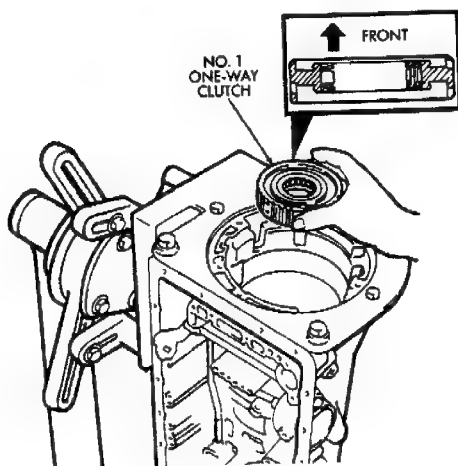


Fig. 14 Installing No. 1 One-Way Clutch

(41) Install replacement seals on second coast brake piston cover and install cover in case.

(42) Install second coast brake piston snap ring with tool B.Vi. FM-29 (Fig. 33).

(43) Check second coast brake piston stroke as follows:

(a) Make reference mark on brake piston rod (Fig. 34).

(b) Apply 57-114 psi air pressure through feed hole (Fig. 34). Alternately apply and release air pressure to operate piston.

(c) Check stroke with gauge (Fig. 35). Use gauge B.Vi.FM. 40 with 4-cyl. transmission. Use gauge B.Vi.FM. 41 with 6-cyl. transmission.

(d) If stroke length is incorrect, piston, cover or snap ring is not seated. Reassemble and check stroke again if necessary.

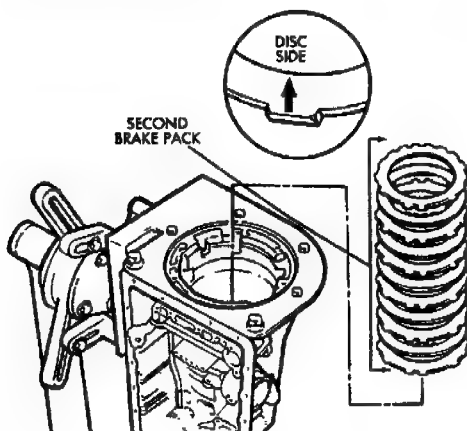


Fig. 15 Installing Second Brake Pack

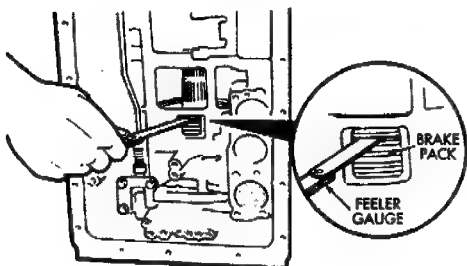


Fig. 16 Checking Second Brake Pack Clearance

(44) Coat thrust race and tabbed washer with petroleum jelly and install them on overdrive support (Fig. 36). Verify race size. Race outer diameter is 50.9 mm (2.004 in); inside diameter is 36.2 mm (1.426 in).

(45) Install overdrive support in case. Use two long bolts to help align and guide support into position (Fig. 37).

(46) Install overdrive support snap ring with tool B.Vi. FM-29 (Fig. 38). Chamfered side of snap ring faces up and toward case front. Snap ring ends must be

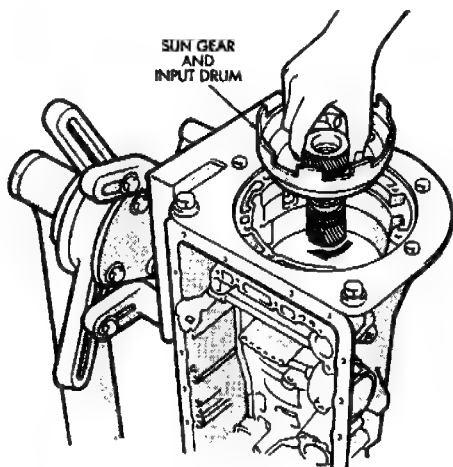


Fig. 17 Installing Sun Gear And Input Drum

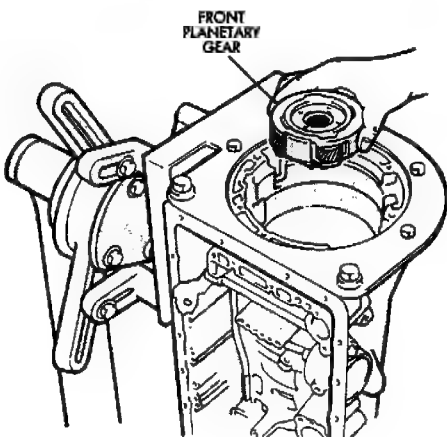


Fig. 18 Installing Front Planetary Gear

aligned with case opening with ring ends approximately 24 mm (0.94 in) from centerline of case opening.

(47) Install and tighten overdrive support bolts to 25 N·m (19 ft-lbs) torque (Fig. 39).

(48) Check output shaft end play with dial indicator (Fig. 40). End play should be .27 to 0.86 mm (.0106 to .0339 in).

(49) If output shaft end play is incorrect, one or more of installed components is not seated. Reassemble as necessary and check end play again.

(50) Install overdrive clutch pack (Fig. 41). Install thickest clutch plate first. Rounded edge of plate faces

up. Install first disc followed by another plate until correct number of discs-plates are installed. Install four discs and three plates in a 6-cyl. transmission and three discs and two plates in a 4-cyl. transmission.

(51) Install stepped ring retainer plate with flat side facing disc. Then install brake pack snap ring (Fig. 42).

(52) Check overdrive brake piston stroke as follows:  
(a) Mount tool B.Vi. FM-35 in dial indicator and position gauge tool B.Vi. FM. 35 against overdrive brake piston (Fig. 43).

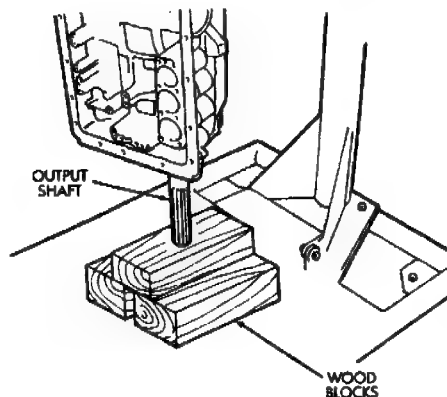


Fig. 19 Supporting Output Shaft

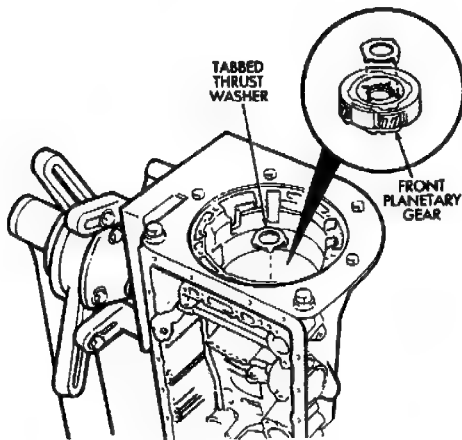


Fig. 21 Installing Planetary Thrust Race

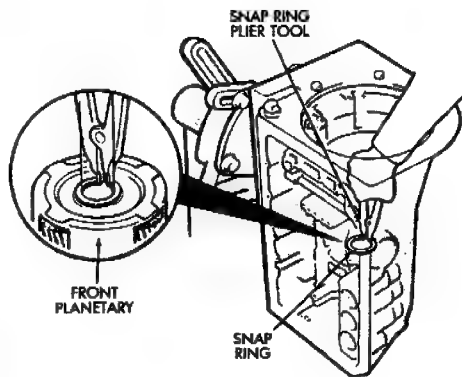


Fig. 20 Installing Front Planetary Snap Ring

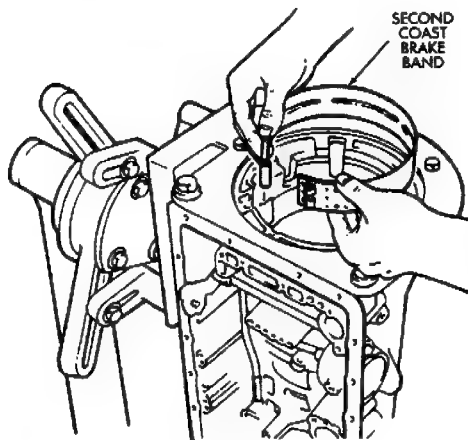


Fig. 22 Installing Second Coast Brake Band

(b) Apply and release brake piston with compressed air. Apply air pressure through feed hole in case (Fig. 44).

(c) Piston stroke length should be 1.32 to 1.62 mm (.052 to .063 in) on 4-cyl. transmissions and 1.40 to 1.70 mm (.55 to .66 in) on 6-cyl. transmissions.

(d) If stroke is incorrect, brake pack or piston is installed incorrectly. Check and correct as necessary and measure piston stroke again.

(53) Remove dial indicator and gauge tool.

(54) Remove overdrive brake piston snap ring and remove overdrive clutch pack components.

(55) Coat overdrive lower race, thrust bearing and upper race with petroleum jelly and install them in overdrive support (Fig. 45). Be sure races and bearing are assembled and installed as shown.

(56) Verify bearing/race sizes before proceeding. Bearing-race sizes are: Outer diameter of lower race is 47.8 mm (1.882 in); inside diameter is 34.3 mm (1.350

in). Outer diameter of bearing is 47.7 mm (1.878 in); inside diameter is 32.7 mm (1.287 in). Outer diameter of upper race is 47.8 mm (1.882 in); inside diameter is 30.7 mm (1.209 in).

(57) Install overdrive planetary ring gear in support (Fig. 46).

(58) Coat ring gear thrust race and thrust bearing assembly with petroleum jelly and install them in gear (Fig. 47).

(59) Verify bearing/race size before proceeding. Outer diameter of ring gear race-bearing is 47.8 mm (1.882 in); inside diameter is 24.2 mm (0.953 in). Outer diameter of bearing (61) is 46.8 mm (1.844 in); inside diameter is 26.0 mm (1.024 in).

(60) Coat tabbed thrust race with petroleum jelly and install it on planetary gear (Fig. 48). Race outer diameter is 41.8 mm (1.646 in); inside diameter is 27.1 mm (1.067 in).

(61) Install assembled overdrive planetary gear and clutch (Fig. 49).

(62) Coat thrust bearing and race assembly with petroleum jelly and install it on clutch input shaft (Fig.

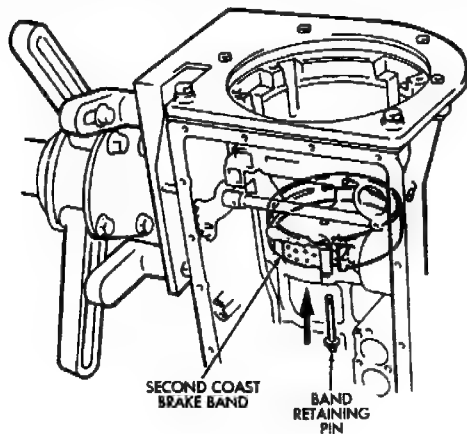


Fig. 23 Installing Band Retaining Pin

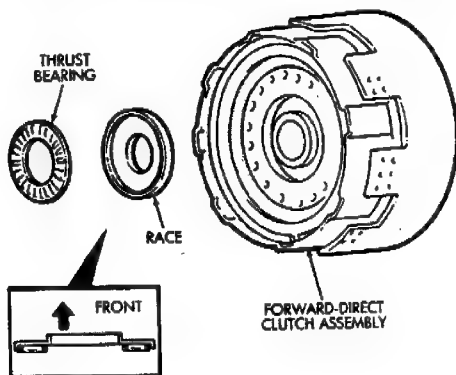


Fig. 24 Installing Forward-Direct Clutch Thrust Bearing And Race

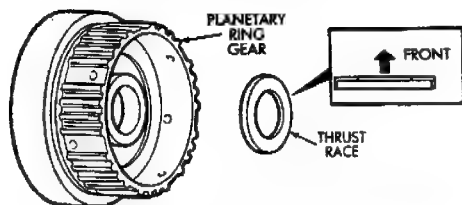


Fig. 25 Installing Planetary Ring Gear Race

50). Bearing and race outer diameter is 50.2 mm (1.976 in); inside diameter is 28.9 mm (1.138 in).

(63) Install overdrive brake pack as follows: "

(a) Install 4.0 mm (.157 in) thick plate first. Rounded edge of plate must face upward.

(b) Install a disc followed by a plate until the required number of discs and plates are installed. Be sure to install the stepped plate last with the flat side of the plate facing the disc (Fig. 51).

(c) Install four discs and three plates in 6-cyl. transmissions. Install three discs and two plates in 4-cyl. transmissions.

(64) Install clutch pack snap ring (Fig. 52).

(65) Coat thrust bearing race with petroleum jelly and install it in oil pump (Fig. 53). Bearing race outer diameter is 47.2 mm (1.858 in); inside diameter is 28.1 mm (1.106 in).

(66) Lubricate and install replacement O-ring on oil pump body.

(67) Install oil pump in case. Align pump and case bolt holes and carefully ease pump into place (Fig. 54).

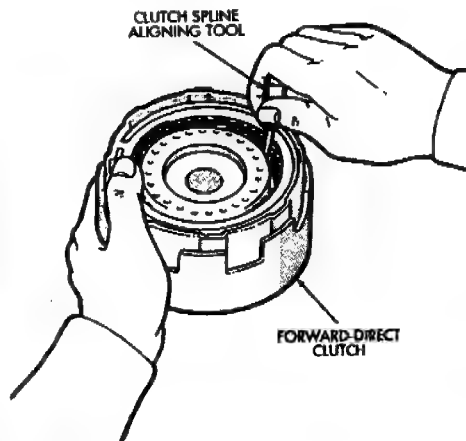


Fig. 26 Aligning Forward-Direct Clutch Splines

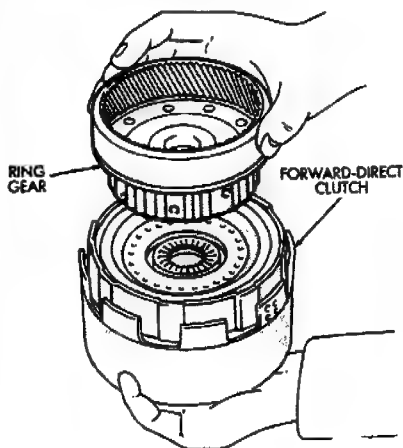


Fig. 27 Installing Front Planetary Ring Gear

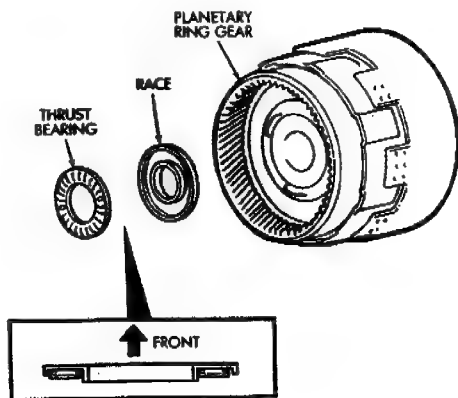


Fig. 28 Installing Ring Gear Bearing And Race

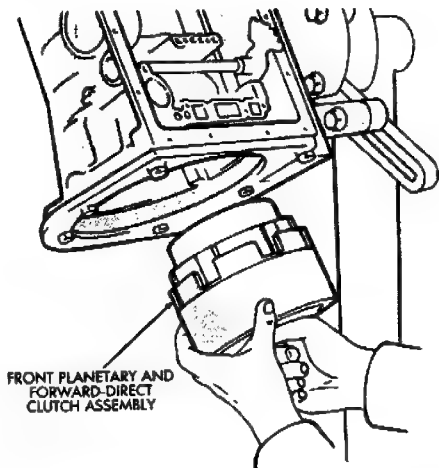


Fig. 29 Installing Front Planetary And Forward-Direct Clutch Assembly

**CAUTION:** Do not use force to seat the pump. The seal rings on the stator shaft could be damaged if they bind or stick to the direct clutch drum.

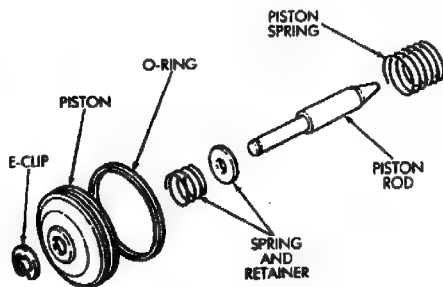
(68) Tighten oil pump bolts to 22 N·m (16 ft-lbs) torque.

(69) Verify input shaft rotation. Shaft should rotate smoothly and not bind.

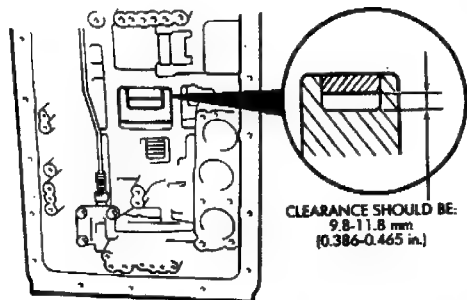
(70) Lubricate and install new O-ring on throttle cable adapter and install cable in case (Fig. 55).

(71) Check clutch and brake operation. Operate clutches and brakes with compressed air applied through feed holes in case (Fig. 56). Listen for clutch and brake apply. If you do not hear a clutch or brake apply, disassemble transmission and repair fault before proceeding. It is necessary to block the over-

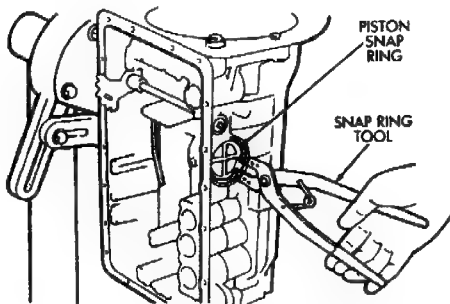
drive clutch accumulator feed hole No. 8 (Fig. 56) in order to check direct clutch operation.



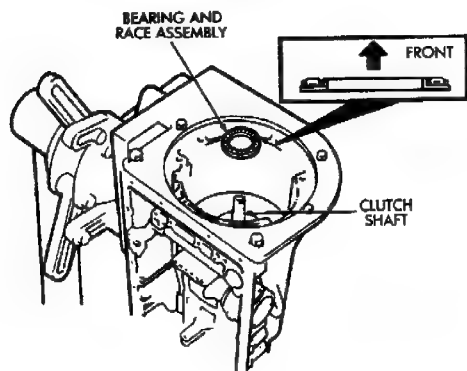
**Fig. 32 Assembling Second Coast Brake Piston**



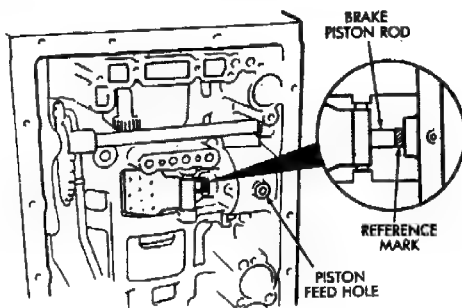
**Fig. 30 Checking Input Drum-To-Direct Clutch Drum Clearance**



**Fig. 33 Installing Second Coast Brake Piston Snap Ring**



**Fig. 31 Installing Clutch Shaft Thrust Bearing-Race Assembly**



**Fig. 34 Marking Brake Piston Rod**

(72) Lubricate and install new O-rings on accumulator pistons (Fig. 57).

(73) Assemble and install accumulator piston components (Fig. 57). Refer to Accumulator Component Identification Chart in Specifications section for piston, spring and pin sizes.

(74) Install new check ball body and spring (Fig. 58).

(75) Position valve body on case (Fig. 59).

(76) Install detent spring (Fig. 59).

(77) Align manual valve, detent spring and shift sector (Fig. 59).

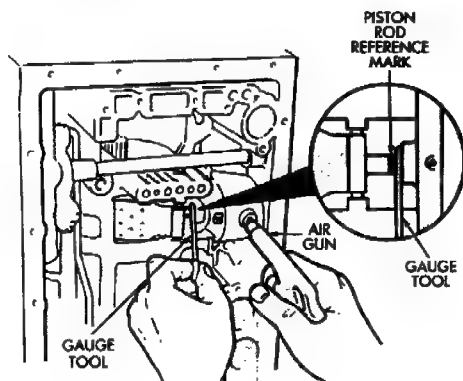
(78) Connect throttle cable to throttle valve cam (Fig. 60).

(79) Install and tighten valve body-to-case bolts to 10 N·m (7 ft-lbs) torque.

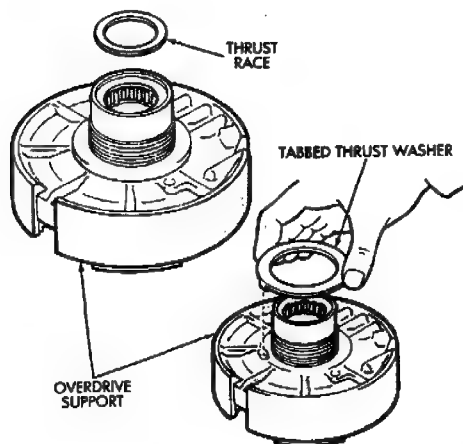
(80) Connect valve body solenoid wires to solenoids (Fig. 61).

(81) Install new O-ring on solenoid harness adapter and secure adapter to case.

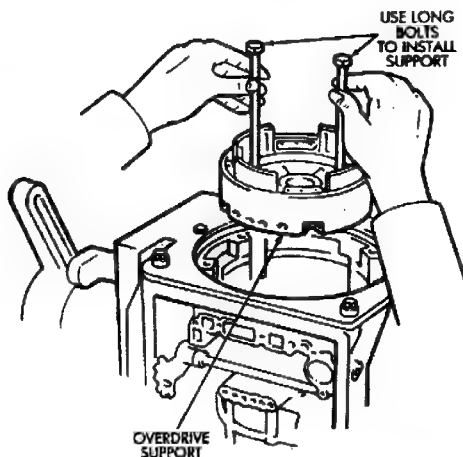
(82) Install valve body oil tubes (Fig. 62). Tap tubes into place with a plastic mallet. Be sure the flanged tube ends and straight tube ends are installed as shown.



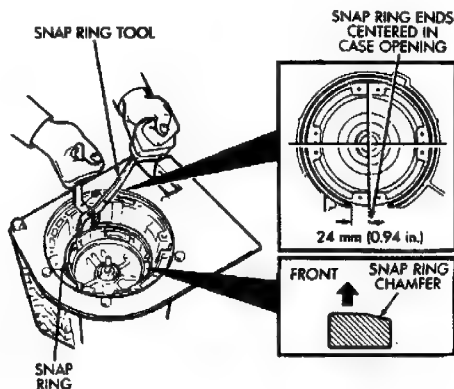
**Fig. 35 Checking Second Coast Brake Piston Stroke**



**Fig. 36 Installing Overdrive Support Thrust Race And Washer**



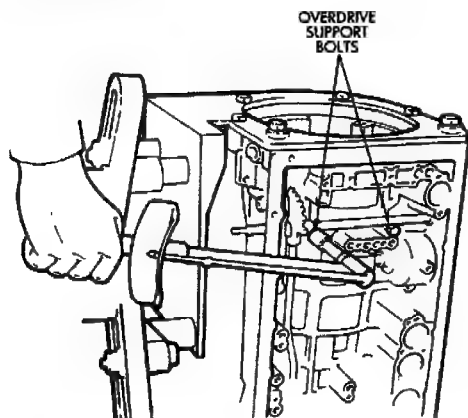
**Fig. 37 Installing Overdrive Support**



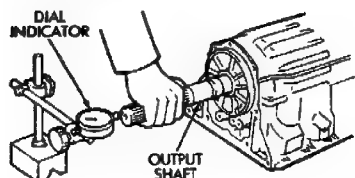
**Fig. 38 Installing Overdrive Support Snap Ring**



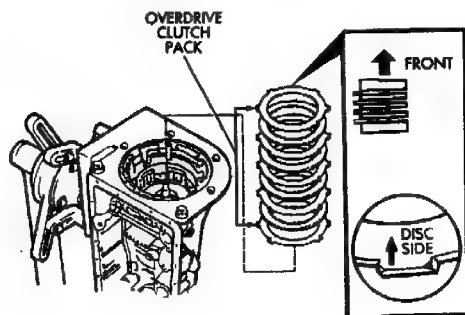
(83) Install new gaskets on oil screen and install screen on valve body. Tighten screen bolts to 10 N·m 7 ft-lbs torque.



**Fig. 39 Installing Overdrive Support Bolts**



**Fig. 40 Checking Output Shaft End Play**



**Fig. 41 Install Overdrive Clutch Pack**

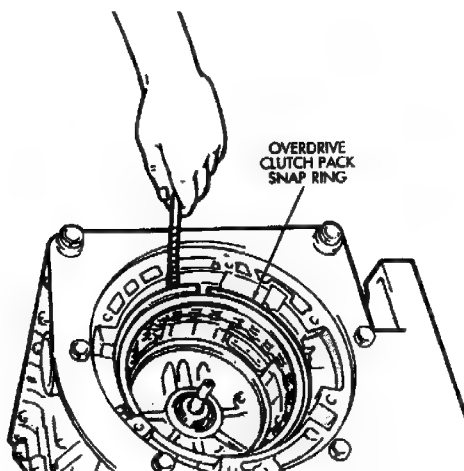
(84) Install magnet in oil pan. Be sure magnet does not interfere with valve body oil tubes.

(85) Apply Three-Bond TB 1281 or equivalent sealer, to sealing surface of oil pan. Sealer bead should be at least 1 mm (.040 in) wide. Install pan on case and tighten pan bolts to 7.4 N·m (65 in-lbs) torque.

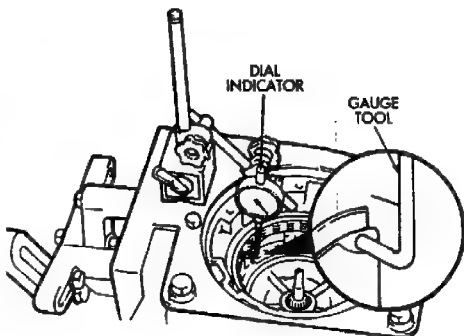
(86) Install speed sensor rotor and key on output shaft (Fig. 63).

(87) Install spacer and speedometer drive gear on output shaft. Then install retaining snap ring (Fig. 64).

(88) Apply bead of sealer to sealing surface at rear of case (Fig. 65). Use Three Bond TB 1281, Loctite 518 or an equivalent sealer.



**Fig. 42 installing Overdrive Brake Snap Ring**



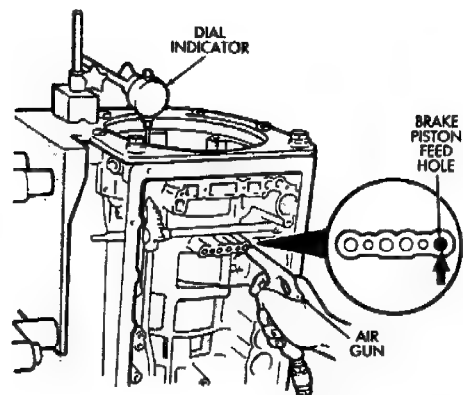
**105 Fig. 43 Positioning Gauge Tool And Dial Indicator**

(89) Install extension or adapter housing on transmission. Tighten housing/adapter bolts to 34 N·m (25 ft-lbs) torque.

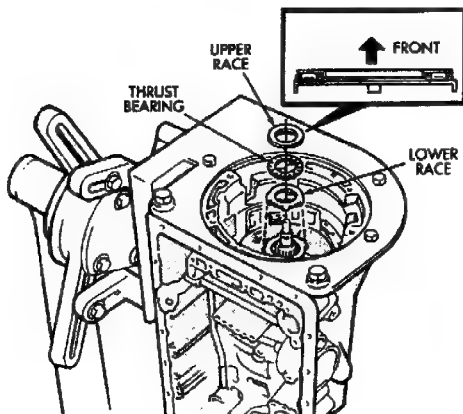
(90) Install speed sensor (Fig. 66). Tighten sensor bolt to 7.4 N·m (65 in-lbs) torque and connect sensor wire harness connector.

(91) Install speedometer driven gear (Fig. 67). Tighten gear attaching bolt to 19 N·m (175 in-lbs) torque.

(92) Install converter housing (Fig. 68). Tighten 12 mm diameter housing bolts to 57 N·m (42 ft-lbs) torque. Tighten 10 mm diameter housing bolts to 34 N·m (25 ft-lbs) torque.



**Fig. 44 Checking Overdrive Brake Piston Stroke**



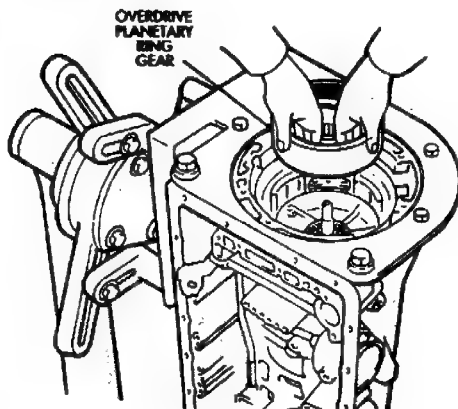
**Fig. 45 Installing Overdrive Support Thrust Bearing And Races**

(93) Install transmission shift control lever on manual valve shaft. Do not install the lever attaching nut at this time.

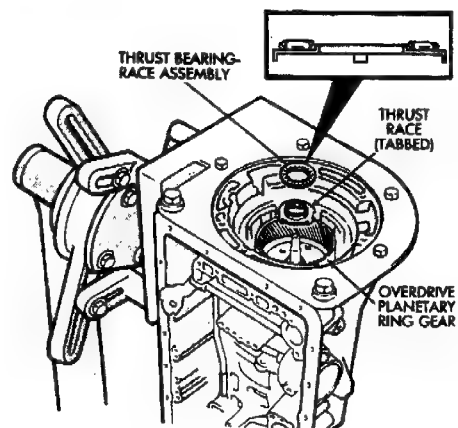
(94) Move shift control lever all the way to rear. Then move it two detent positions forward.

(95) Mount neutral safety switch on manual valve shaft and tighten switch adjusting bolt just enough to keep switch from moving (Fig. 69).

(96) Install neutral switch tabbed washer and retaining nut (Fig. 69). Tighten nut to 6.9 N·m (61 in-lbs) torque, but do not bend any of the washer tabs against the nut at this time.



**Fig. 46 Installing Overdrive Planetary Ring Gear**



**Fig. 47 Installing Ring Gear Thrust Bearing And Race**

(97) Align neutral switch standard line with groove or flat on manual shaft (Fig. 69).

(98) Tighten neutral switch adjusting bolt to 13 N·m (9 ft-lbs) torque.

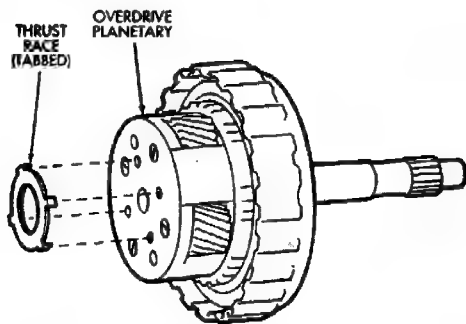
(99) Install shift control lever on manual valve shaft. Tighten lever attaching nut to 16 N·m (12 ft-lbs) torque.

(100) Install retaining clamp for wire harness and throttle cable (Fig. 70).

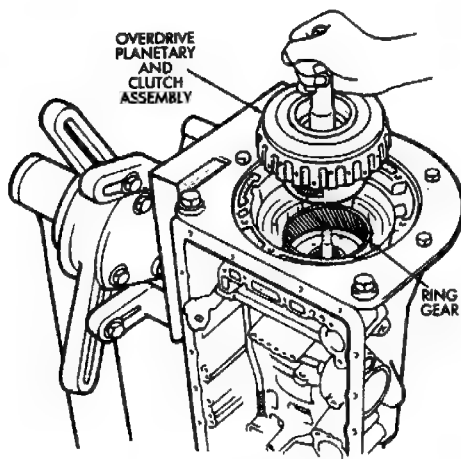
(101) Install torque converter.

(102) Verify that converter is seated by measuring distance between converter housing flange and one of the converter mounting pads (Fig. 71). Use straightedge and vernier calipers to measure distance. On 4-cyl. transmissions, distance should be 17.5 mm (.689 in). On 6-cyl. transmissions, distance should be 16.5 mm (.650 in).

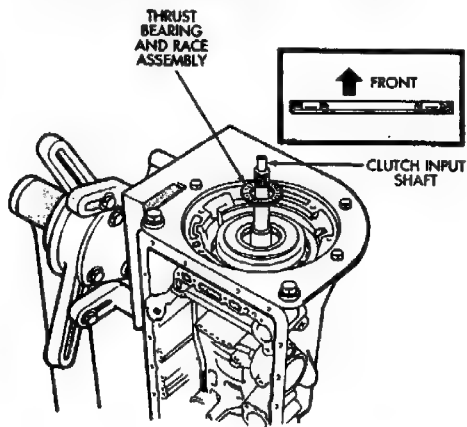
(103) Install lower half of transmission fill tube (install upper half after transmission is in vehicle).



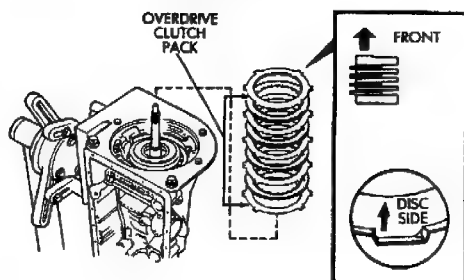
**Fig. 48 Installing Planetary thrust Race**



**Fig. 49 Installing Overdrive Planetary And Clutch Assembly**



**Fig. 50 Installing Input Shaft Thrust Bearing And Race Assembly**



**Fig. 51 Installing Overdrive Clutch Pack**

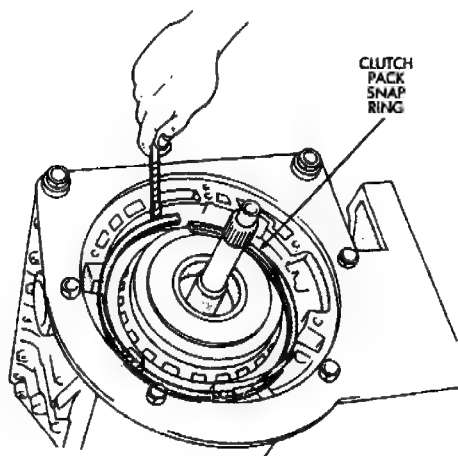


Fig. 52 Installing Clutch Pack Snap Ring

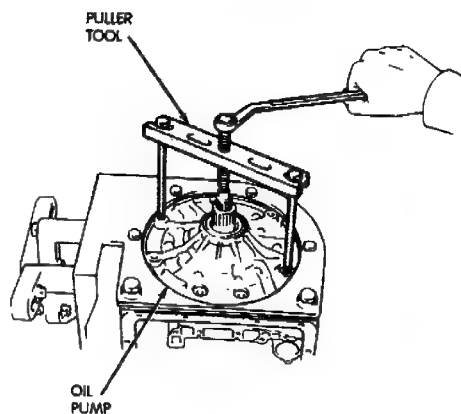


Fig. 54 Installing Oil Pump

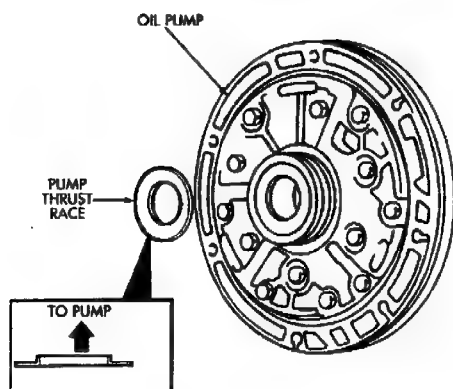


Fig. 53 Installing Oil Pump Thrust Race

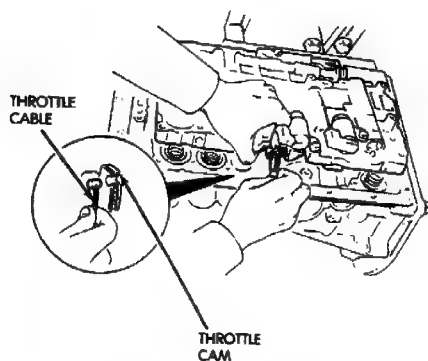
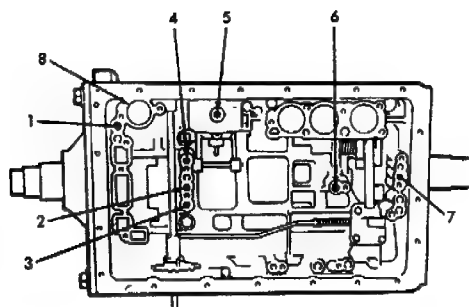
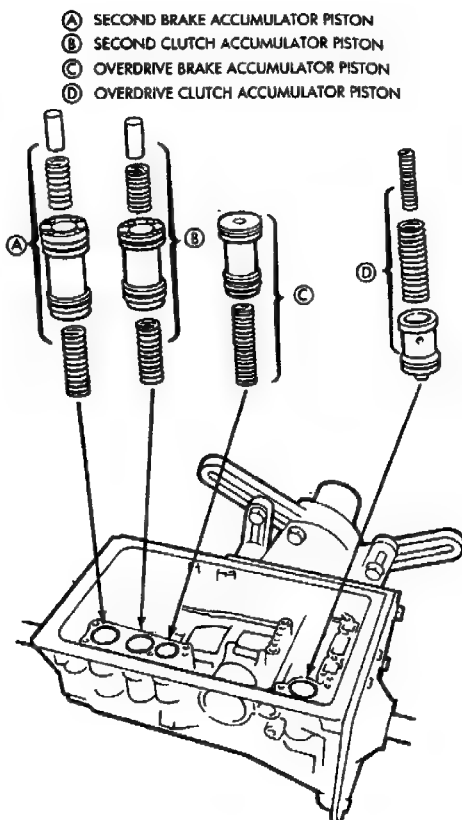


Fig. 55 Installing Throttle Cable

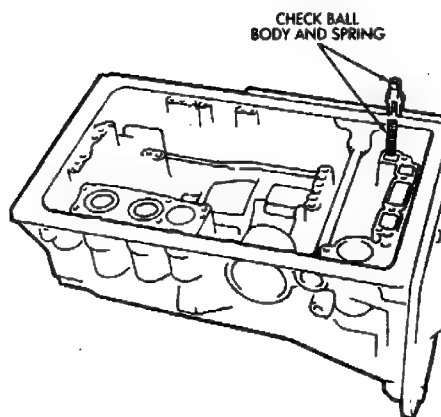


1. OVERDRIVE DIRECT CLUTCH FEED
2. DIRECT CLUTCH FEED
3. FORWARD CLUTCH FEED
4. OVERDRIVE BRAKE FEED
5. SECOND COAST BRAKE FEED
6. SECOND BRAKE FEED
7. FIRST-REVERSE BRAKE FEED
8. OVERDRIVE CLUTCH ACCUMULATOR PISTON HOLE (BLOCK THIS HOLE WHEN CHECKING DIRECT CLUTCH OPERATION)

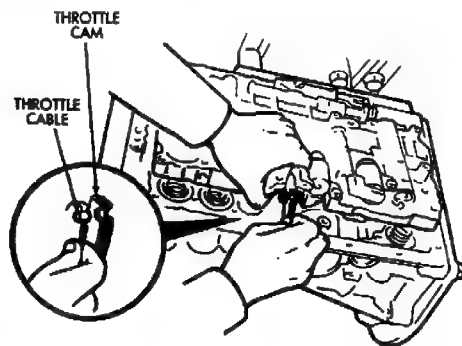
**Fig. 56 Clutch And Brake Feed Hole Locations**



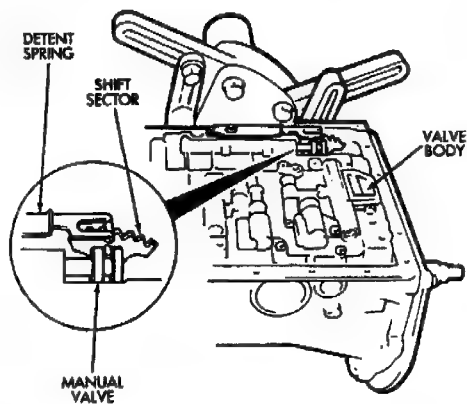
**Fig. 57 Installing Accumulator Pistons**



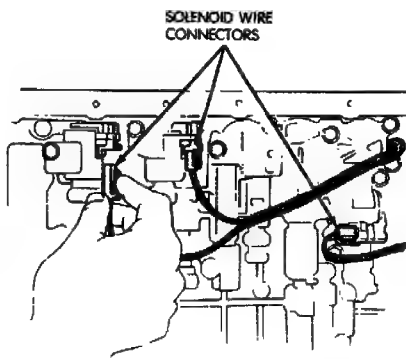
**Fig. 58 Installing Check Ball Body And Spring**



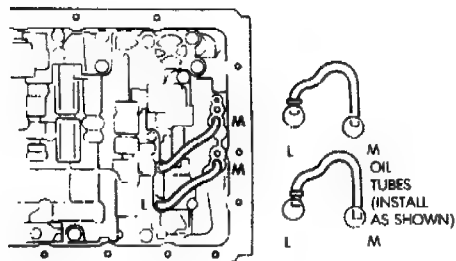
**Fig. 60 Connecting Throttle Cable**



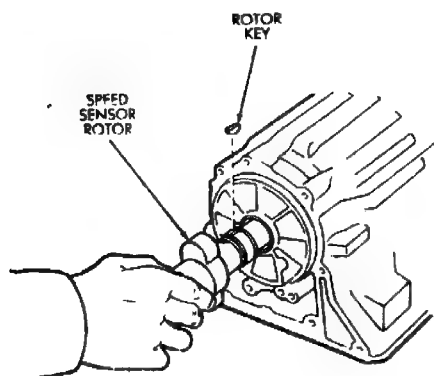
**Fig. 59 Aligning Manual Valve, Shift Sector And Detent Spring**



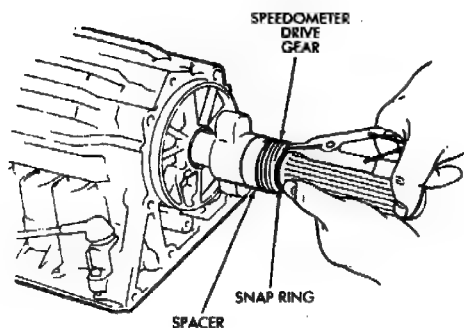
**Fig. 61 Connecting Valve Body Solenoid Wires**



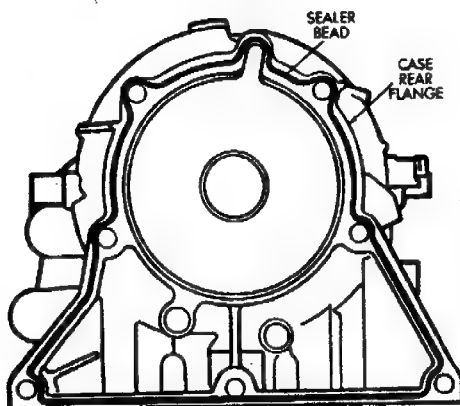
**Fig. 62 Installing Valve Body Oil Tubes**



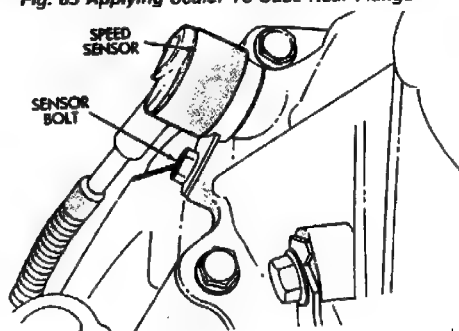
**Fig. 63 Installing Speed Sensor Rotor And Key**



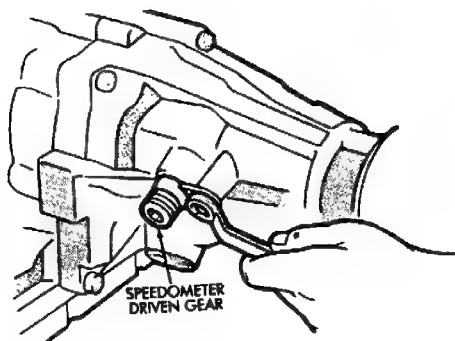
**Fig. 64 Installing Spacer And Speedometer Drive Gear**



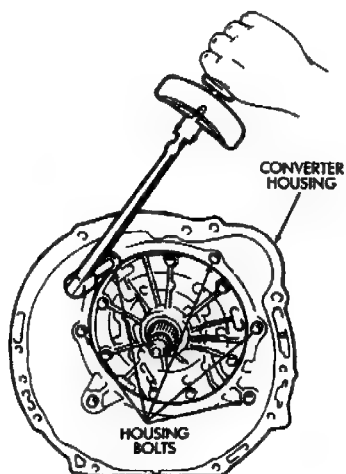
**Fig. 65 Applying Sealer To Case Rear Flange**



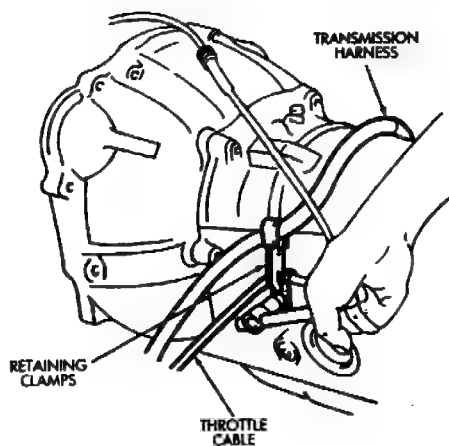
**Fig. 66 Installing Speed Sensor**



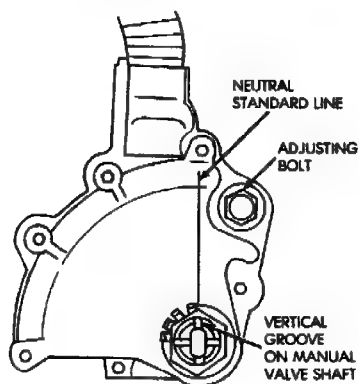
**Fig. 67 Installing Speedometer Driven Gear**



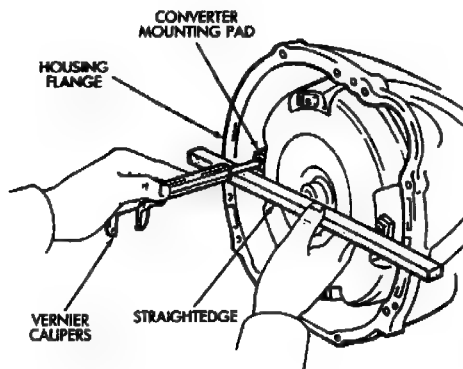
**Fig. 68 Installing Converter Housing**



**Fig. 70 Installing Cable/Harness Clamps**



**Fig. 69 Neutral Switch Installation/Adjustment**



**Fig. 71 Checking Converter Installation**

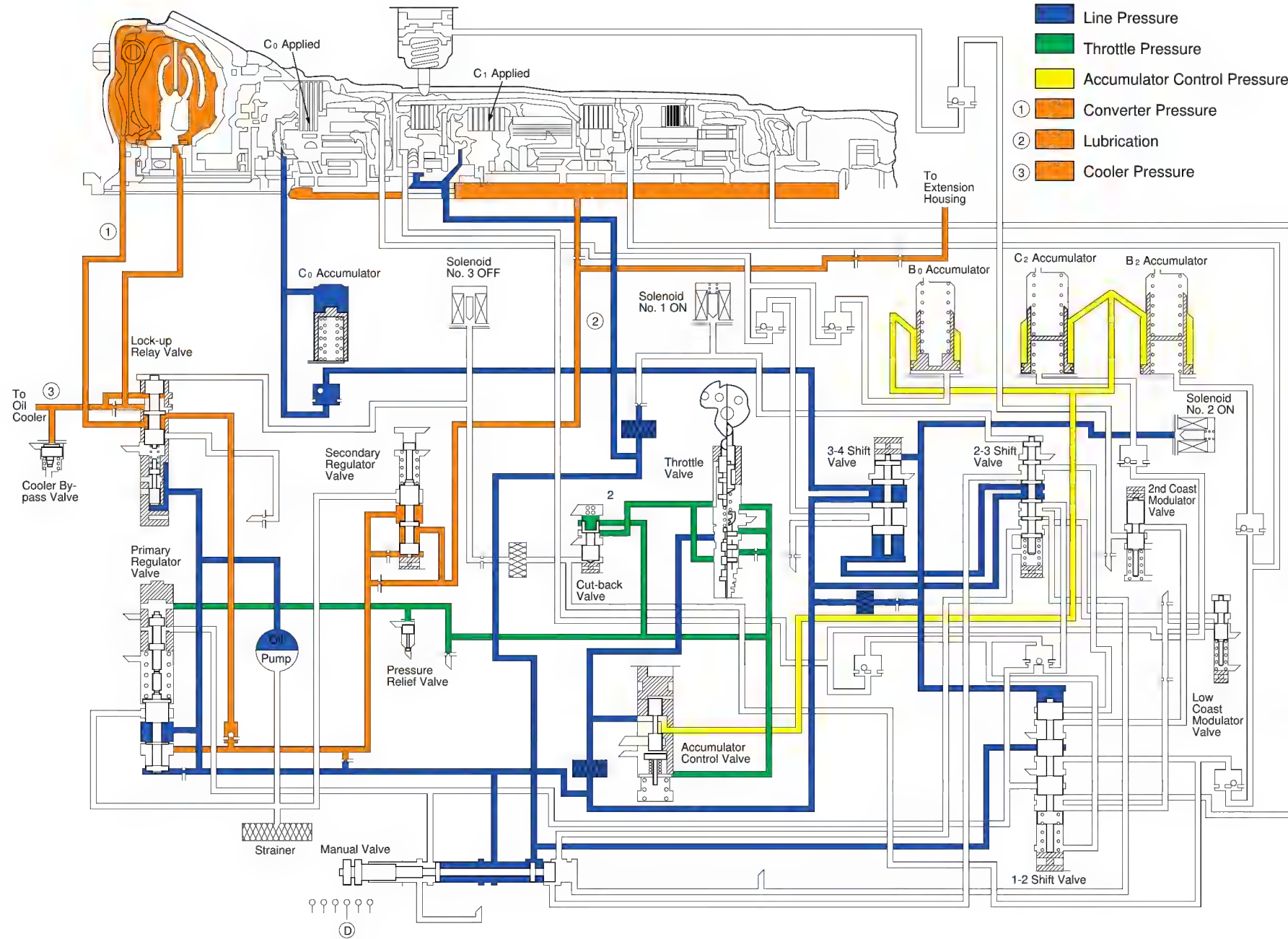


# Aisin Warner 4

## "D" Range - 1st Gear

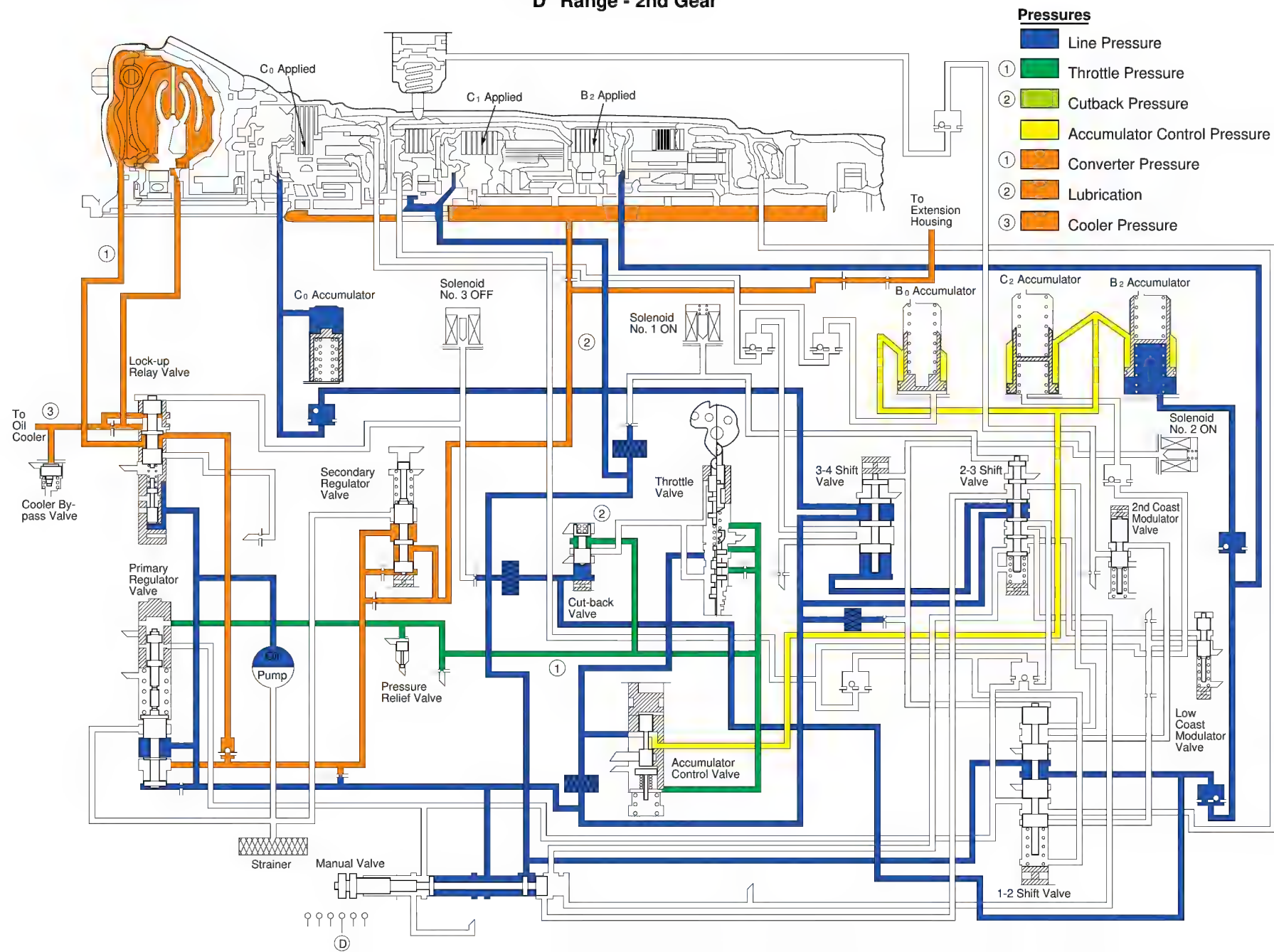
### Pressures

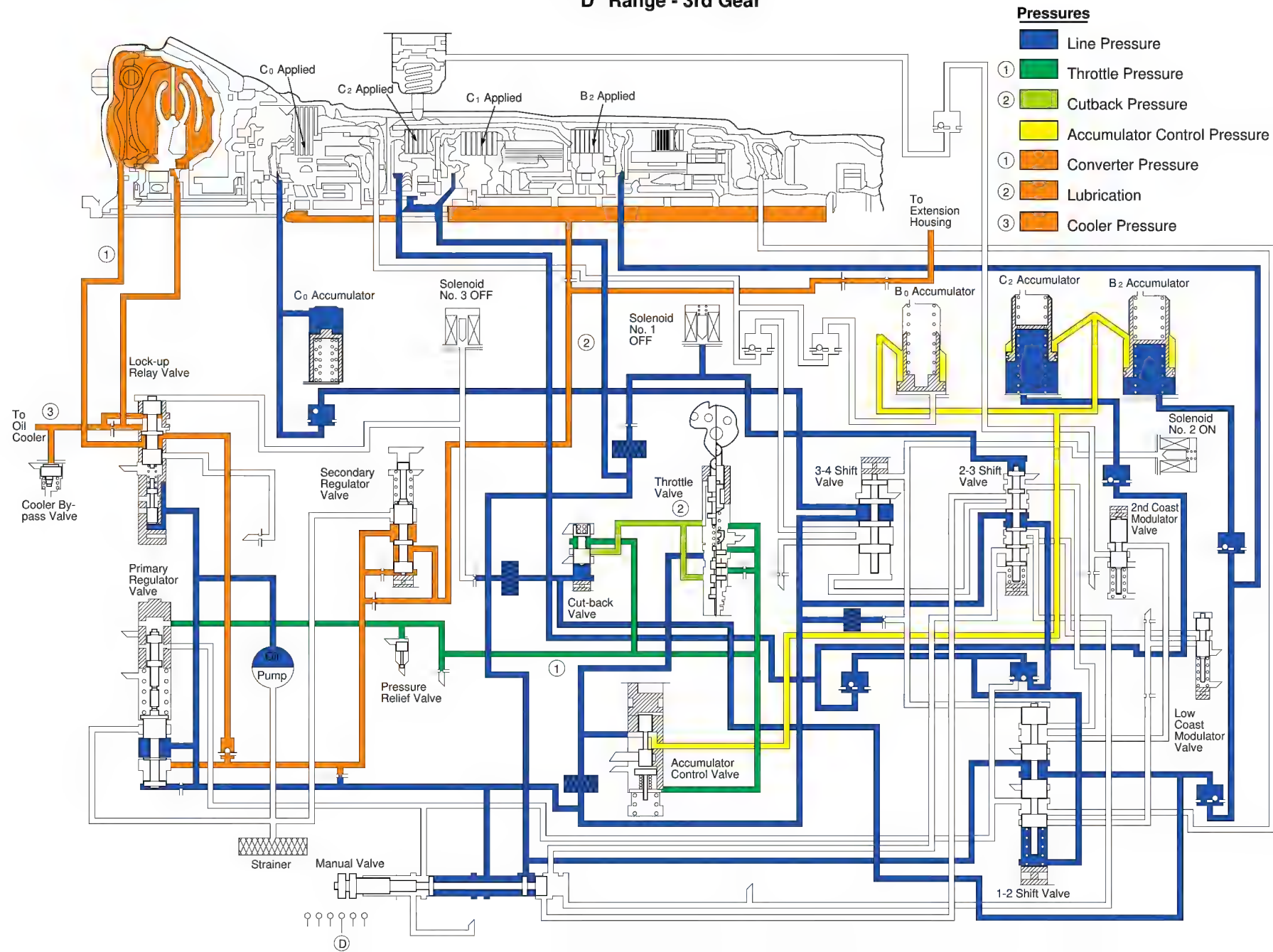
- Line Pressure
- Throttle Pressure
- Accumulator Control Pressure
- ①  Converter Pressure
- ②  Lubrication
- ③  Cooler Pressure



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# Aisin Warner 4 "D" Range - 2nd Gear





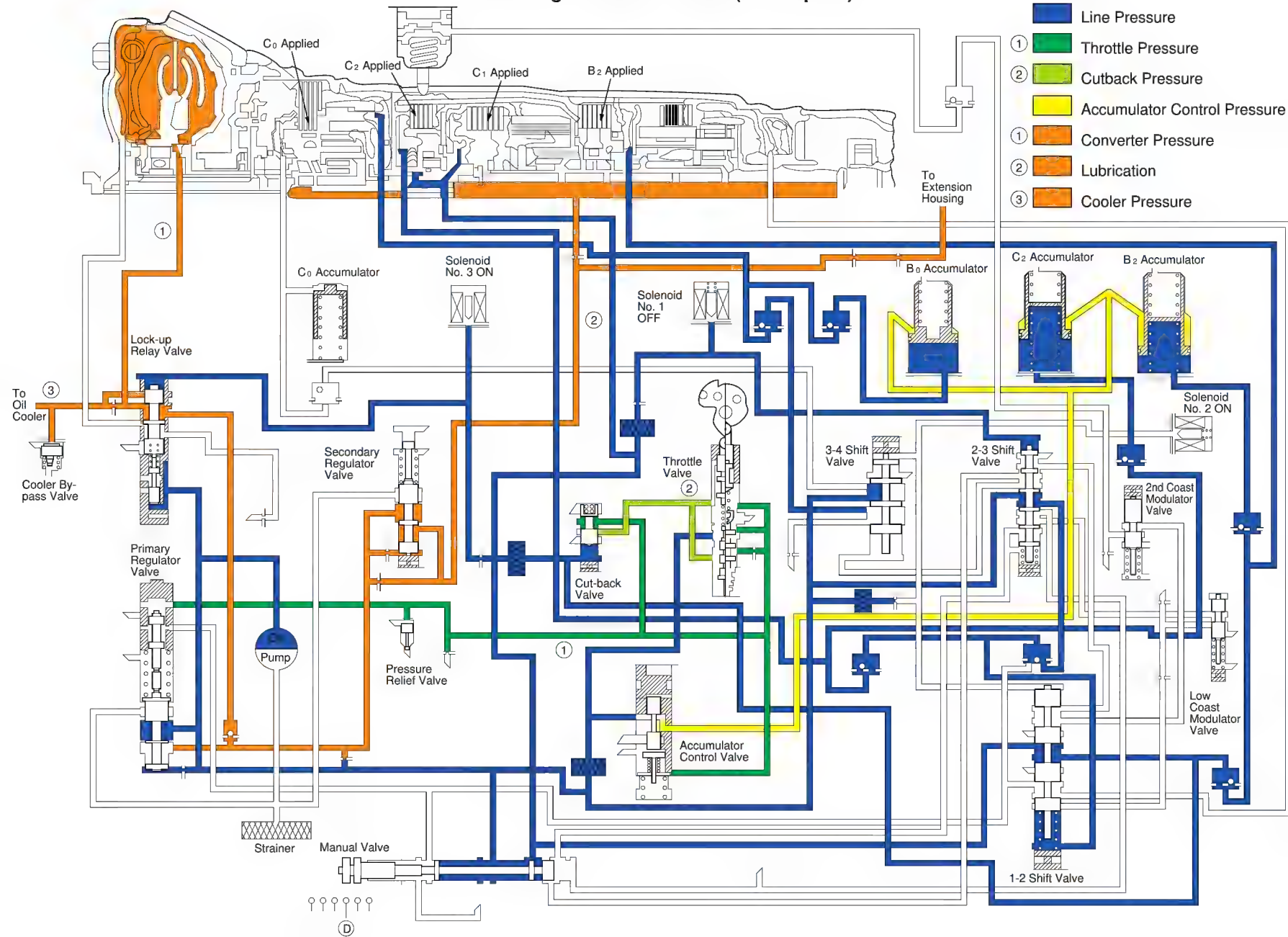


# Aisin Warner 4

## "D" Range - Overdrive Gear (Lock-up On)

### Pressures

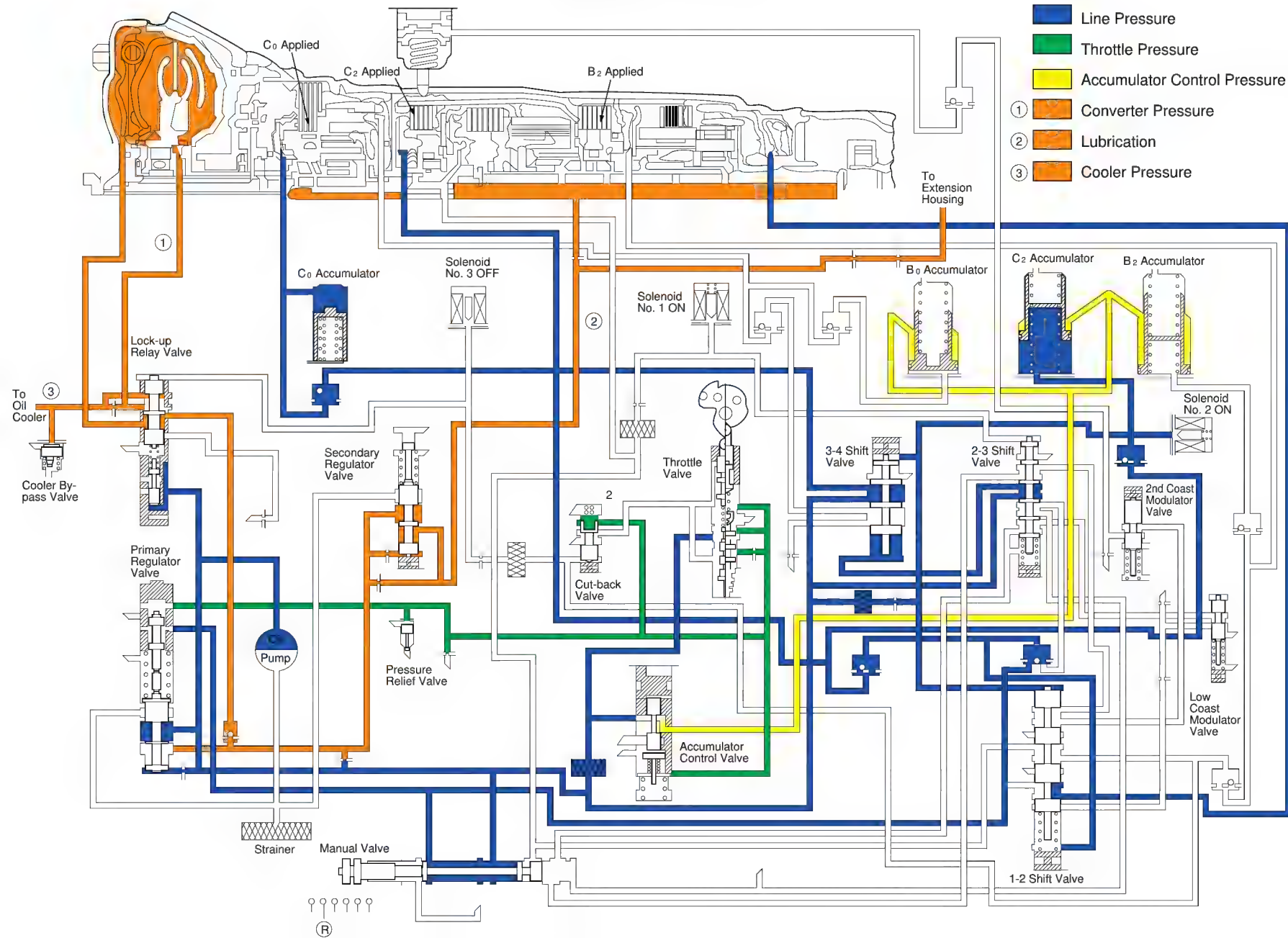
- Line Pressure
- ① Throttle Pressure
- ② Cutback Pressure
- Accumulator Control Pressure
- ① Converter Pressure
- ② Lubrication
- ③ Cooler Pressure



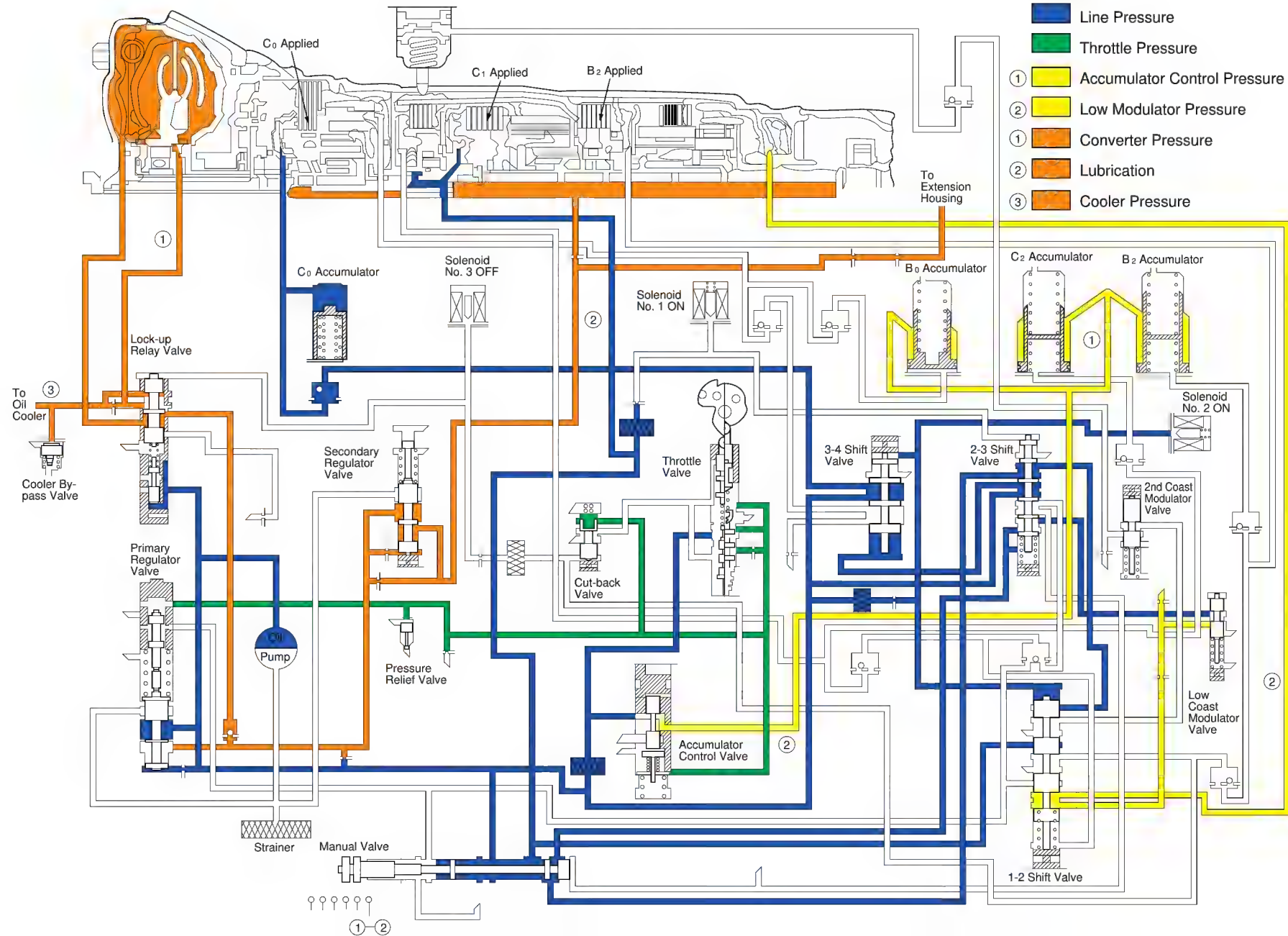
# Aisin Warner 4 "R" Range - Reverse Gear

## Pressures

- Line Pressure
- Throttle Pressure
- Accumulator Control Pressure
- ①  Converter Pressure
- ②  Lubrication
- ③  Cooler Pressure



# Aisin Warner 4 "1-2" Range - 1st Gear



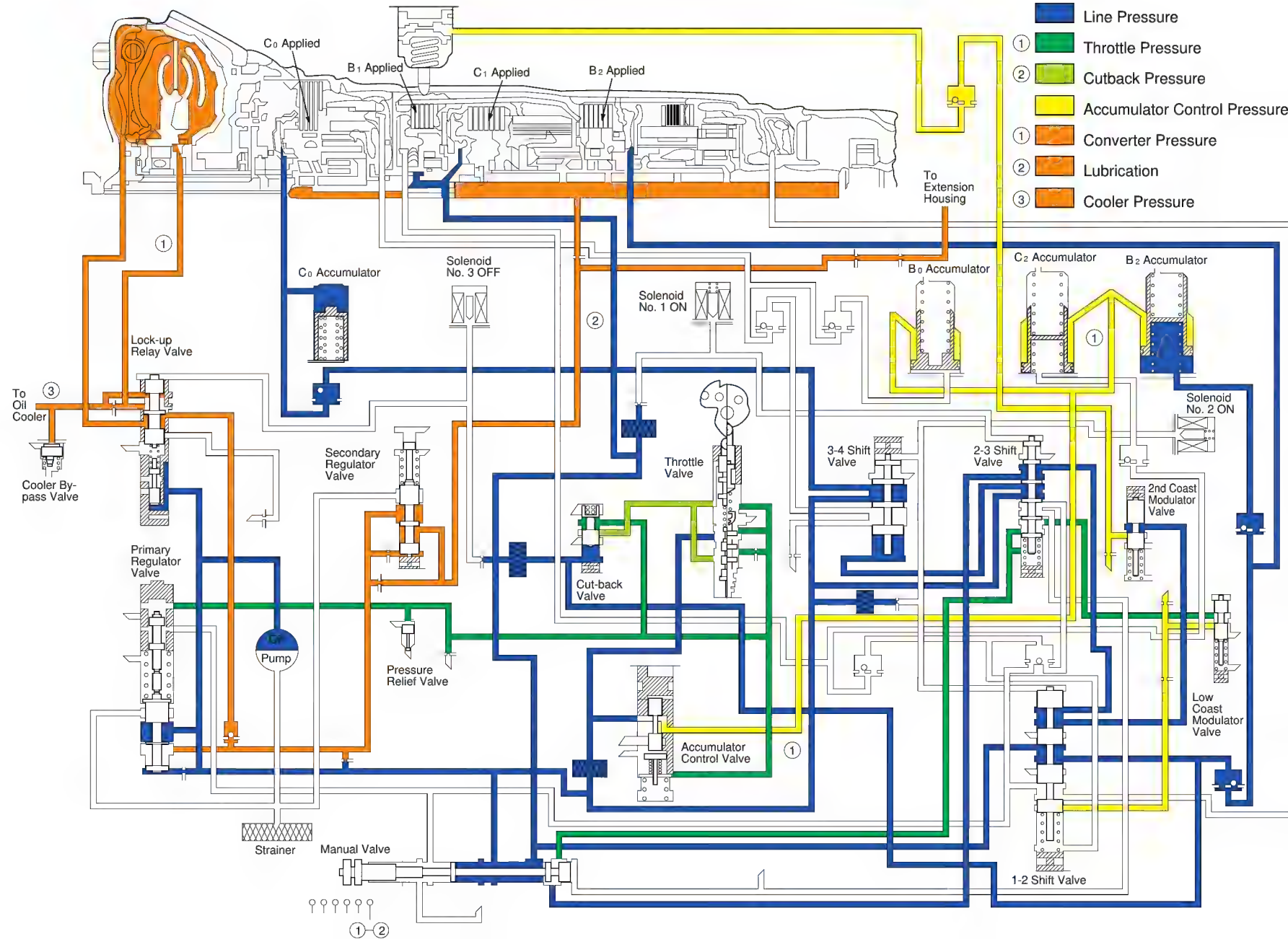


# Aisin Warner 4

## "1-2" Range - 2nd Gear

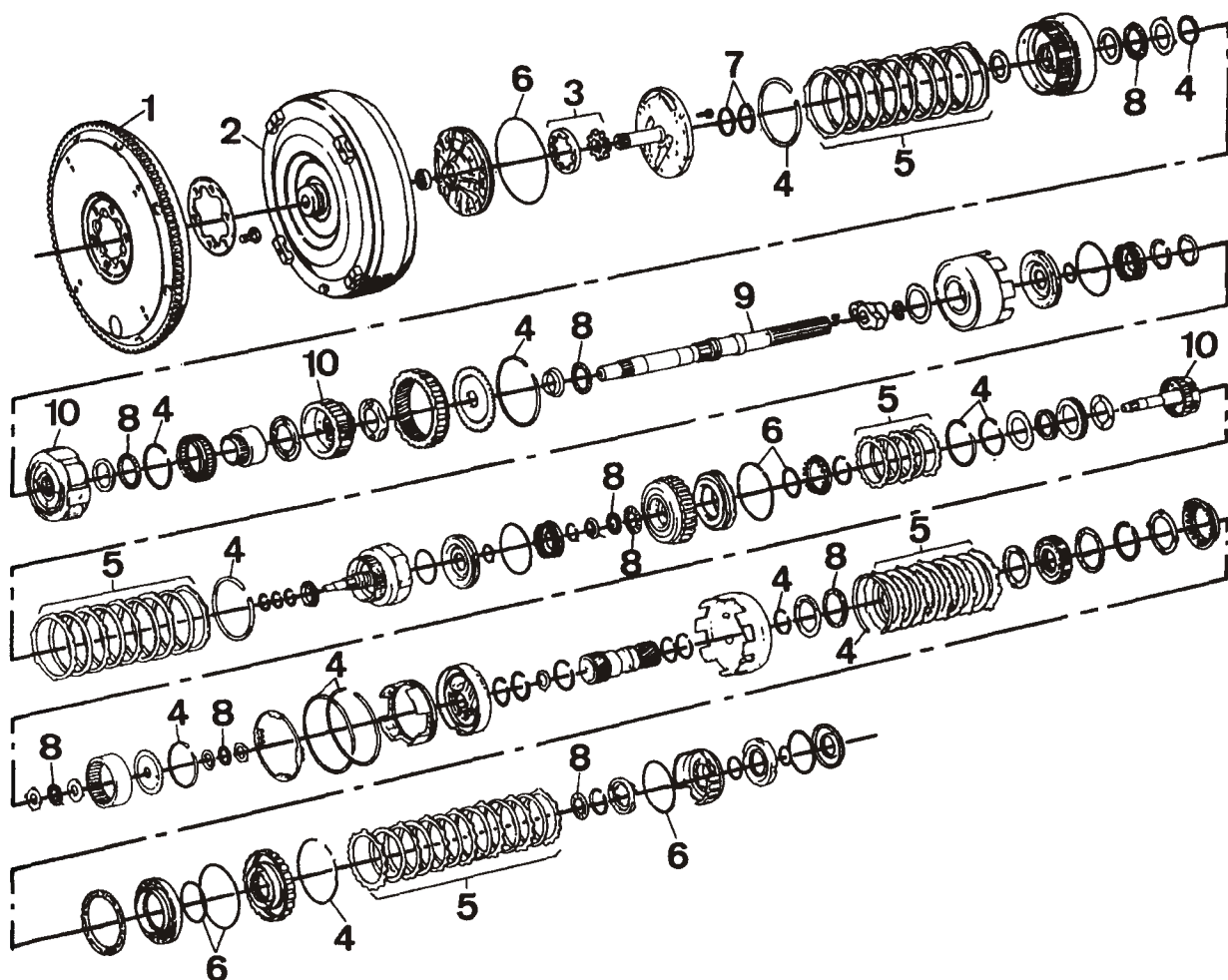
### Pressures

- Line Pressure
- Throttle Pressure
- Cutback Pressure
- Accumulator Control Pressure
- ① Converter Pressure
- ② Lubrication
- ③ Cooler Pressure



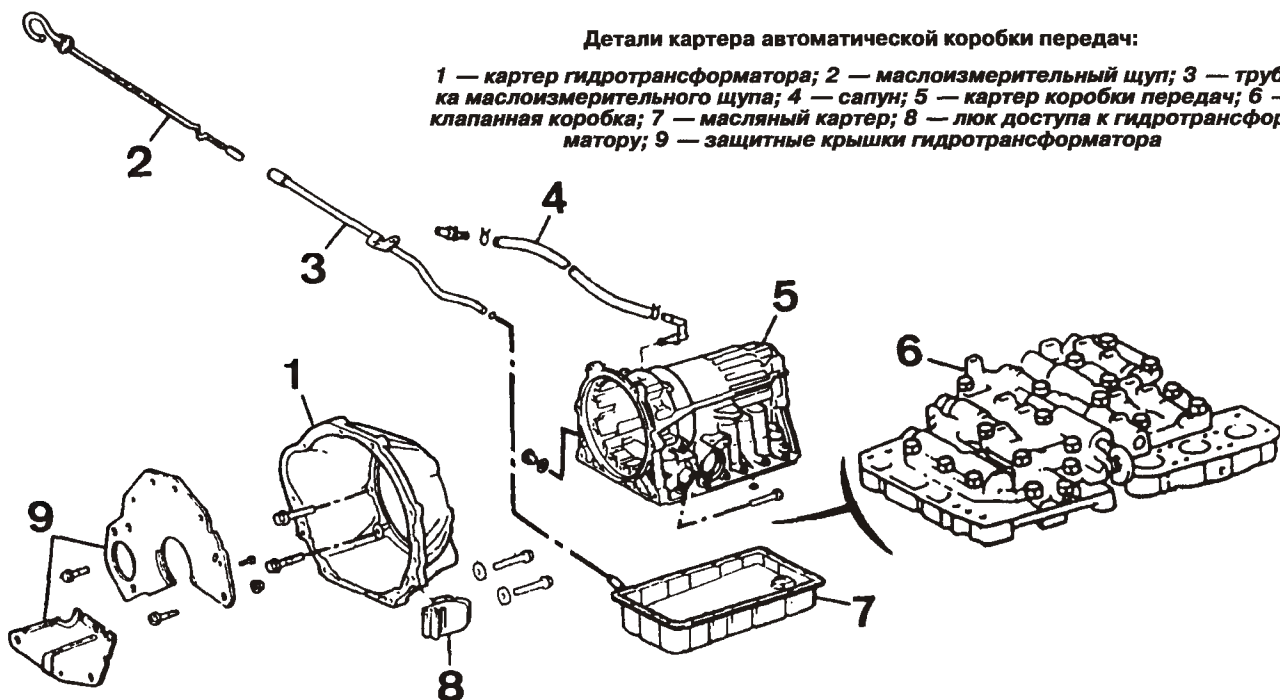
### Детали автоматической коробки передач:

1 — маховик двигателя; 2 — гидротрансформатор; 3 — масляный насос; 4 — стопорные кольца; 5 — диски фрикционных; 6 — уплотнительные кольца; 7 — сальники; 8 — упорный игольчатый подшипник; 9 — входной вал; 10 — блоки планетарных шестерен



### Детали картера автоматической коробки передач:

1 — картер гидротрансформатора; 2 — маслоизмерительный щуп; 3 — трубка маслоизмерительного щупа; 4 — сапун; 5 — картер коробки передач; 6 — клапанная коробка; 7 — масляный картер; 8 — люк доступа к гидротрансформатору; 9 — защитные крышки гидротрансформатора





(the diagram was removed as a courtesy to the compushift patent holder, even though the diagram previously displayed was not of the patented technology specifically)

Two things control AW4 shifting:

- 1) Shift lever (lever position controls tranny valves mechanically)
- 2) Transmission Control Unit

The shift lever makes a very positive move in control... only weak point being there is no separate position for 1-2... they're combined. Position 1-2 holds in 1, provided there is no TCU connected. If you have a TCU connected, you'll get a 1-2 upshift at about 4800rpm.

The shift lever does do one thing that the TCU cannot accomplish- ENFORCING compression braking via transmission's internal overrunning clutches and sprags.

Other than this, all other transmission controls are performed by the TCU.

TCU monitors throttle position, ground speed, and shift lever position (switches in the console) to select gears appropriately. It also monitors position of the POWER/COMFORT switch to change upshift and downshift points and TCU lock parameters.

The TCU's outputs are very simple- three wires. One for Tranny Solenoid 1, one for Tranny Solenoid 2, and one for Tranny Solenoid 3.

Solenoids 1 and 2 (abbreviated SOL1 and SOL2) perform ratio selection as follows:

	SOL1	SOL2
1st	1	0
2nd	1	1
3rd	0	1
OD	0	0

Where 1= ON, and 0= OFF.

Make a switch that will give these outputs, and you'll have a 1-2-3-OD stick shift which needs no clutch.

SOL 3 is very simple. Put power to it, and the Torque Converter will lock.

About operation:

The ratio selection is very straightforward-

If you disconnect the TCU, and connect a switchbox, put your CONSOLE LEVER in D, and you'll have ABSOLUTE control over which ratio is selected via the control switch. Your switchbox is the ONLY thing that determines gear selection at that point. When you want 2nd, pull the stick to the "2" position, etc. You can shift it MUCH quicker than the auto system did, as there is a latency period included in the TCU's programming. Downshifting is instantaneous, and when dealing with traffic, very impressive. Upshifting still has some latency, as the transmission's hydraulic circuits have control orifices, etc., to prevent double-engagement and internal breakage. These buffers (sometimes referred to as accumulators) also provide 'cushioning' for servos, to prevent harsh shifting.

If, while using a switchbox, you move the console lever from D into some other gear, the transmission will respond directly to the console lever, as the lever acts directly on shift control valves, overriding solenoid functionality.

If, while using the switchbox, you make a downshift (i.e. OD-3rd or 3rd-2nd), you'll find that there's a decent amount of compression braking available, however, you'll find that pulling the console lever awards MORE compression braking. This is because the console lever also acts upon the tranny's overrun sprag operation... in english, that means it prevents the tranny from going into it's idea of a 'freewheeling coast mode'. Using the switchbox, the transmission will allow a partial freewheel action, again, the reason here has to do with TCU programming and the possibility of what happens when/if a TCU fails.

#### The Torque Converter Lock:

Solenoid 3 is unique, in that it only controls TC lock functions. Being able to lock up a torque converter awards you with improvements in fuel mileage, a cooler-running transmission, and less cabin noise. It's like having one more gear (a friend of mine is convinced that I've got a 5-speed automatic).

Although it's possible to lock the TC in EVERY ratio, it really only works consistently in 2,3, and OD. Reason for locking it in OD is obvious- you're toolin' down the highway. Locking it in 3rd is nice when you're in town and rolling through a flat 40mph zone with no traffic... keeps the RPMs down, and keeps them loud pipes from waking the neighborhood pets. Locking it in 2nd is handy for maneuvering down gravel byways and dirt roads, when you're rolling along at 20mph and don't like lugging the engine in 3rd. Locking it in 1st is pretty much worthless, and not too good for the TC.

In some instances, I've forgotten to unlock the TC when coming to a stop. It downshifts just fine... feels alot like doing a downshift with a stick... firm, not slushy. When you come to a stop, either the TC unlocks itself (by nature of how the hydraulic plumbing works) or it bangs a bit, then stalls the motor... usually I flick the switch off before anything happens.

Putting too much foot into the throttle with the TC locked will give you a quick wake-up call... the TC lock is not intended to handle full engine torque (remember where your peak torque occurs- fairly low...) and it'll give you a soft jolt if you forget to unlock before feeding too much fuel. Mine has given me a warning only a few times... and only when going slow, and giving it more than 1/2 throttle. It handles the lazy 'lugging' around town just fine... just don't climb anything steep. Besides, the torque converter is your friend- it multiplies torque output in exchange for higher engine RPM... so only lock up when you know you don't need much oomph.

One thing I will tell you about TC lock- The TCU is programmed to force TC lockup when engine RPMS are above a certain point (?dunno yet?), AND you're at Wide Open Throttle. Why? Easy: top speed. The AW4's TC has a very HIGH stall speed (translates to high torque multiplication factor, and higher RPM out-of-the-hole)... if you allow 2400rpm of stall, that means the transmission's input shaft speed will be quite a few RPMs lower than crankshaft speed when you're under one of those MACK-3 speed runs. At WOT, you're cooking down the highway above 90, and the torque multiplication factor really isn't required... you need more tranny RPMs.

Remember how I said the TC lockup mechanism wouldn't handle full engine torque? Well, when you're screaming down the highway at WOT, engine RPMs are usually well above the engine's peak torque point... it's not developing peak TORQUE (although it may be generating peak HP). Locking the TC here

>From a blank-stare perspective, it's not obvious, but look at this:  
Since the TCU is comparing throttle position to that sensor, your shift points WILL be different... and if you did a mathematical comparison between HI and LO range shift points, you'll probably observe them to be different... not because of anything that the TCU is doing differently- it's because your throttle-demand in HIGH range will be higher than when

in LO range. Takes more torque to accelerate in HI than LO.

Now read the explanation of the Throttle Valve's function (again, right there in the text)... it modulates pressure... it doesn't control the SHIFT POINT, but it does control SHIFT PRESSURE... the side effect of changing shift pressure is a change in how QUICKLY brake-band servo pressure rises.

And it's been a while since I last had hands in mine, and am not able to verify right now, but I believe I recall the TV cable biases BACKWARDS in relation to pressure- meaning, pressure is relieved at high-throttle, rather than raised... but beware- high throttle is not necessarily the same thing as HIGH RPM!

Some of you guys could be observing high shift-points simply because the combined TV setting and RPM are such that servo shift pressure only loads the accumulators so quickly.

I've noticed that my (TCU-less) XJ has a nominal upshift delay of about 1/2 to 3/4 second under normal conditions. The downshift delay, however, is almost instantaneous. I recall noticing that the TV cable adjustment affects the rapidity of upshifts, however, I don't recall it ever affecting downshifts. Of course, no adjustments to the TV cable had any effect on what RPM my XJ shifts at- since there's no TCU, the shift-point RPM is controlled only by my switch. Same goes for the TC lock- it's on a switch. Totally manual, totally hillbilly, but it does work... when neither an '88 nor '93 TCU will.

BTW... I haven't had any problems winding her up to 5 grand... but I wouldn't advise you leaving it there for hours on end... and you should make sure it's warmed up before spinning it that fast. If you happen to be running an HO motor, you'll notice that it's powerband is very stout up there. I actually built a 250ci Chevy inline (dimensionally very similar to the 4.0) for my boat using the 5krpm as an assumed WOT point, and it's happy as a clam to do it for essentially all day... and hasn't had a bit of problems (other than vibrating a few bolts loose) in over 1500 hours.

I wouldn't recommend running your XJ 4.0 under 5krpm WOT conditions for periods longer than about 14 seconds, though... because in most cases, you'll be well over the national speed limit. In all remaining cases, you're stuck and in dire need of a winch. ;-}

DK :-)